COMPUTERWORLD

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RCA Unbundles; Offers 6-Year Payout Lease

By Drake Lundell
CW New York Bureau

NEW YORK – RCA Corp. has announced the first full commerical lease purchase program in the industry for computer systems. Under the plan, a user who signs a special six-year contract will receive a 15% reduction from the normal lease rates and will own the computer at the end of the six years.

The new policies cover only the latest machines in the RCA line – the Spectra 70/46, 70/60, and the 70/61 – and will apply to both new customers and orders already taken, RCA said. The firm predicted that these machines will account for over 50% of bookings in 1970.

Lease Purchase Plan Set

In the past, RCA and other computer manufacturers have offered full payout lease purchase plans to government and military customers, RCA said. With the new commercial plan, RCA has extended this concept into the commercial realm.

Lease plans, with an option to purchase after a certain period of time, are available from all the other major manufacturers. However, a customer can only apply a percentage of the rental principal toward the purchase price.

An RCA user can cancel the contract anytime after the first year, but would then have to pay the discount he had received while the computer was installed. During the time of the contract, RCA said, the price of the machine and the lease rate could not be changed.

RCA said that it expected more than half of the computer contracts written in 1970 to be under this new plan.

Unbundling Decision

RCA also became the last of the "big eight" computer manufacturers to announce its unbundling decision last week and it now appears that users will have a wider range of options under the RCA system than under any of the present unbundling plans.

Under the RCA plan, computer users will either be able to purchase or lease computer systems with full systems support at the present rate or receive a 3% price reduction on their computer systems if they choose to lease

(Continued to Page 4)

DoD $ Hit

Students at the University of Illinois protest Illiac IV, a $24 million Defense Department-funded computer at the university. But the school's faculty approved Illiac [story on page 4].

Walking the Streets

DP Job Market Turns Shaky in LA Region

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES – According to statements from employment agencies and computer industry personnel, the Southern California economic situation, particularly the programmer job market, is in serious condition.

"Programmers are walking the streets for the first time in the 10 years I've been hiring them," said a Los Angeles data center head. The personnel man for a major defense-supported employer of programmers said: "This is an aerospace and defense disaster area. We are trying to hold onto our best programmers in hopes that things get better. When we have to let people go we advise them that they had better be prepared to travel to find a job."

The California Department of Employment told *Computerworld* that in the last six months the available supply of programmers has tripled. The employment yardstick has moved from the classification of "demand" to "balanced." It is not yet into the "surplus" category. Time Kennedy, occupational analyst with the Department of Human Resources Development, said that the commercial and business programmers are still in the demand category. The problem with engineering-scientific programmers lie in major cutbacks in the aerospace and defense industries plus a number of small business failures and layoffs that have put a lot of people into the job market. He also said that the scientific programmers make more money than commercial programmers and even if there wasn't the price barrier, the two types of programmers just can't switch fields.

The head of a computer industry employment firm reported similar findings. "There is a surplus of lesser qualified people. Companies are being more careful of the people they hire because of the tightened economy. They are trying to get more experienced people, three to five years of experience, and they are being more selective. A guy that's been making $12,000 a year and wants $16,000 is going to have trouble.

All employment sources said employers are looking for only experienced help. As one man put it, "employers don't consider training classes adequate. If they can't find the experienced man they want they promote from within and send a present employee to IBM's training class."

As the standard for hiring only experienced people would affect efforts to get jobs for disadvantaged people, the Urban League Data Processing Training Center

(Continued to Page 4)

CDC Revises Proprietary Rights

MINNEAPOLIS, Minn. – Control Data Corp. has revised its controversial software policy to affirm "certain proprietary rights" of its customers, and provide for a pre-acceptance period for CDC licensed software products.

After unbundling, CDC apparently became interested in marketing software improvements, whether generated by the users or company analysts, and so demanded "world-wide, and royalty-free license" to these improvements [CW, Dec. 10, 1969].

Users objected, claiming that such a license would jeopardize the confidentiality of certain applications, while having the side effect of depriving them of compensation for their DP know-how.

The former CDC customer contract stated specifically that the company would have unlimited license to all data processing techniques and concepts disclosed by the user to the company, and furthermore, that none of these concepts would be held confidential.

Under new contracts implementing the policy changes, modifications or improvements to Control Data software by the customer, or CDC analysts working on behalf of the user, belong "exclusively to the customer."

Customers will also have a period of 90 days in which to accept or reject CDC software prior to initiation of use charges, unless the customer uses the software for his own productive purposes within that period.

Option Given

The new policy also gives customers the option to return unused software within the 90-day period, without charge.

Robert M. Price, vice-president of systems and data services marketing, said the adjustments in CDC policies resulted from a continuing evaluation of the corporation's unbundling program – "an evaluation which," he added, "has significantly benefited from discussions between Control Data and its customers."

A CDC spokesman said that users retain their rights to their own software. He said that the issue never came up, before the company's unbundling, and that it is now stated policy that a customer's software is "his own."

Calculated Computer Errors Manipulate Three Banks' Security; $1 Million Lost

NEW YORK – Five men, including a bank vice-president, have been arrested and charged in mid-March with cheating two banks out of over a million dollars by outsmarting the bank computers.

Three brothers, Anthony, John, and Salvatore Giordano; Martin Shaughnessy, a former assistant branch manager for Bankers Trust; and Matthew J. Kelly, a vice-president of the National Bank of North America, were charged in a federal suit with misapplication of funds at a federally insured bank.

The brothers were allegedly able to manipulate bank funds without the banks computers detecting them by making out deposit slips for cash transactions when they were actually depositing checks, according to the district attorney's office.

Since cash transactions are recorded as immediate deposits, checks subsequently drawn were covered by the false cash deposits.

If the deposits were made as checks, the computers would not credit the money to the account immediately. When checks were drawn, the computer would indicate insufficient funds with an uncollected check on deposit, a spokeman for the district attorney's office said.

Ordinarily, a teller or branch manager would notice checks deposited as cash and refuse to accept them. Shaughnessy was fired immediately after the discovery of the check-kiting scheme for "failing to follow bank policies and procedures," according to a Bankers Trust spokesman.

Two Companies Involved

Two companies were involved in the operation of the scheme, according to the district attorney's office. Bay Auto Sales had an account at the National Bank of North America and Baywood Stables had an account at the Bankers Trust, both in Jamaica, Queens.

The Giordano brothers were members of both companies. In addition, Salvatore Giordano had an account in his own name at the Bankers Trust branch.

The scheme was uncovered when a bank messenger failed to deliver a bundle of checks to the clearing house, leaving $440,000 worth of checks uncovered.

Four-Year Operation

The federal charges refer to checks drawn between January, 1967 and April, 1969, but Queens authorities said that the operation had been going on for

(Continued to Page 4)

On the Inside

Data Systems Should Meet Users' Needs *– Page 9*

Datanet–500 Offers Users Flexibility *– Page 33*

Business, Industry . . . 49
Editorials 10
Education 39
Financial 61
Societies 38
Software 27
Systems/Peripherals . . 33

Hospital Hails Automated Billing: "Untouched by Human 1@†$%†%$@"

CLIFTON SPRINGS, N.Y. – The local hospital reported "good publicity and general acceptance" of computerized billing, after the first statements were sent out with a typewritten notice that they were "untouched by human hands, human hands, human hands, human l@†$%†%$@."

PR Gimmick

The letter was apparently a public relations gimmick to alert hospital patients to common delays or errors during transition.

The letter read as follows:

"In an effort to provide you with faster, more accurate billing, we are using a computer for the first time.

"This statement was automatically produced by our new computer, untouched by human hands. . . .

"If it runs true to form, it undoubtedly will be wrong.

"If it is, please tell us.

"Please don't get mad, get mad, get mad, get mad, get mad, get mad, get mad.

"We won't either, either, either. In case of error, do *not* contact our *computer!* Instead, please write to. . . .

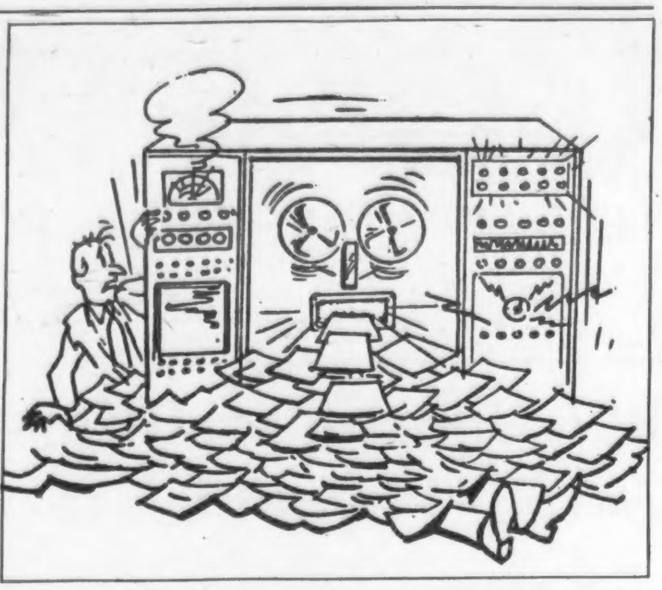
"THANK YOU, THANK YOU, THANK YOU, THANK YOU, THANK YOU, THANK YOU."

Press Attention

The letter received much attention in the press, including wire service stories to newspapers around the world.

However, many of the news stories did not explain that the letter was typed by human beings, and was not computer-generated.

When asked about the "computer problem" which caused the letter to be written erroneously, a hospital employee said: "No problem at all. It was just a little humorous note" to prepare patients for contingencies; and computerization was greeted with "positive attitudes."



" . . . untouched by human hands, human hands, human 1@†$%†%$@." (Cartoon drawn on the Clifton Springs Hospital letter)

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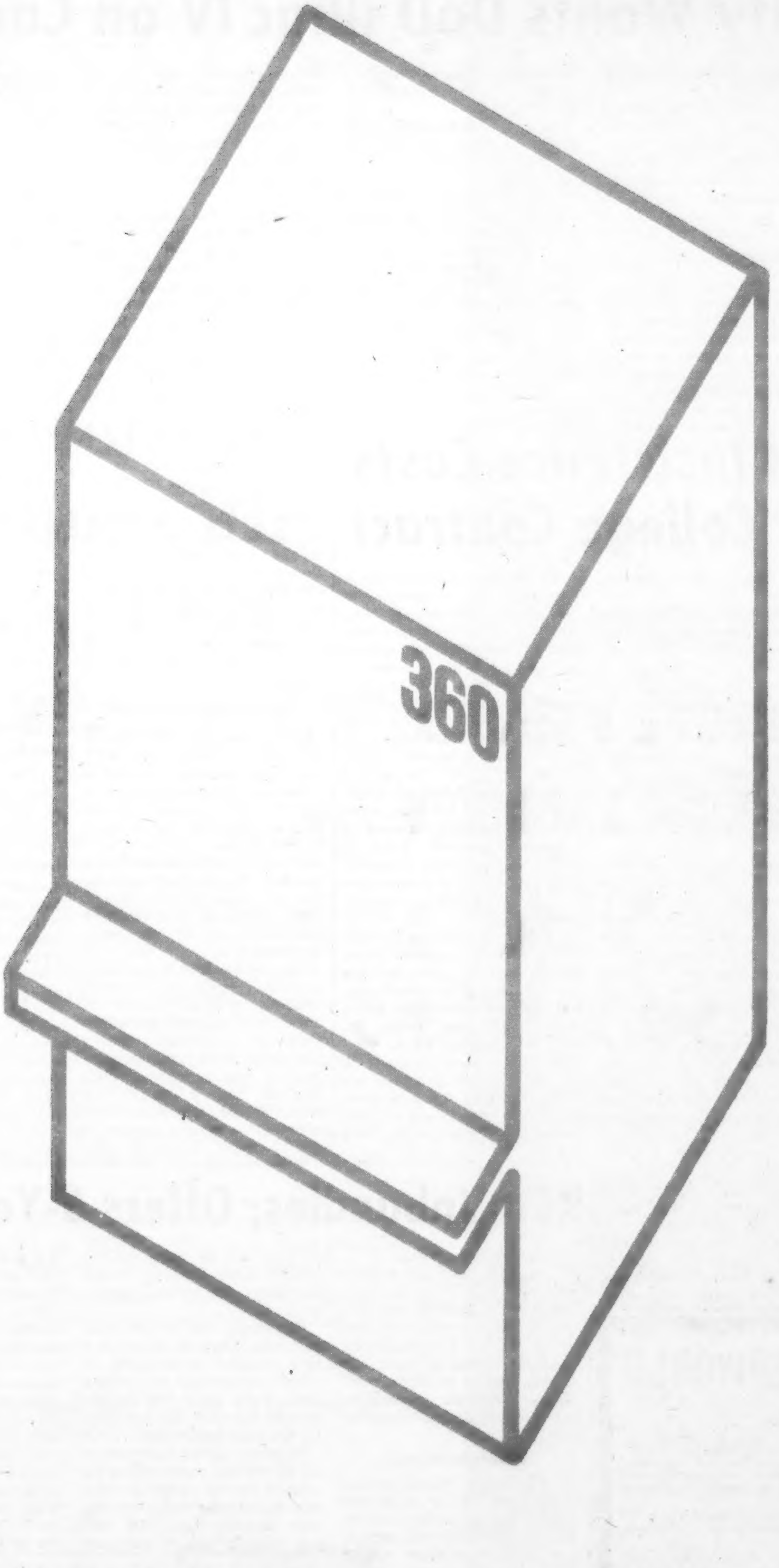
360

Illinois Faculty Wants DoD Illiac IV on Campus

By Joseph Hanlon
CW Staff Writer

URBANA, Ill. – Illiac IV, a huge Defense Department-funded computer, received a vote of confidence March 16 from the University of Illinois faculty.

Some students and faculty had objected to Illiac IV because it meant a large increase in on-campus military research.

One professor complained: "Just when other schools are cutting back on DoD work, we are increasing ours." He also complained that although Illiac IV was well known on campus, the DoD funding was kept secret until the campus newspaper, *The Daily Illini,* exposed it early this year.

The faculty voted by a wide margin to approve a Center for Advanced Computation which would administer and use Illiac IV. The computer is already under construction, and a no vote by the faculty would not have kept Illiac off campus.

Cost: $24 Million

Illiac IV is funded entirely by the Advanced Research Projects Administration (Arpa) of the Department of Defense (DoD), and Arpa will use two-thirds of Illiac's time. So far, Arpa has alloted $24 million, $3 million more than original estimates. The university is also building a $1 million facility to house Illiac IV.

The computer was designed at Illinois and is being built by Burroughs for expected delivery late this year.

It is by far the most advanced computer known to employ parallel processing. It can perform, under certain conditions, 200 million operations per second, 10 times more than any machine presently operating.

Illiac IV a Prototype

Although most of the controversy at Illinois has centered around possible military use of the computer, there will probably be relatively little such use.

The real military importance of Illiac IV is that it is a prototype for computers which have a wide range of military applications, ranging from feasibility studies for new weapons to military logistics.

An Arpa spokesman explained that the military (and civilian users as well) will probably purchase many Illiacs for its own use, – after the design, construction, debugging, and testing have been completed at Illinois. The spokesman said that the nature of the programs being run at Illinois was unimportant. "We need big problems to test a big machine."

Military Logistics

One important area for an Illiac-type machine would be military logistics planning. A source said that if the military were faced with a problem such as the 1965 invasion of the Dominican Republic, it could first use such a machine to simulate various invasion plans and select the best one. Then, once the invasion began, Illiac could control the logistics of the invasion.

"Massive Number Cruncher"

Illiac IV has been described as a "massive number cruncher." The single-quadrant version is composed of 64 subunits, all of which can operate simultaneously. Illiac IV was designed to include four such quadrants and there is only one control per quadrant. Each subunit must do the same thing; if one subunit adds, all must add. But 64 additions can be performed simultaneously.

This means that Illiac IV is especially useful for anything involving a large number of linear or differential equations, such as simulations, weather forecasting, fluid dynamics problems, or military logistics. Prof. Michael Sher estimated that Illiac would take only five minutes to solve a system of 4,000 linear equations with 10,000 variables. Such a problem would take six to eight hours on an IBM 360/75, he said.

Other computers throughout the country will be able to turn to Illiac for their "number crunching" via the Arpa computer net. This net is a linkage of computers at Arpa contractors, and permits any user to use programs at any other computer as part of his program. Four users are now tied into the Arpa net, and 10 more will be by the end of the year. Net members will include MIT, Harvard, Rand Corp., Stanford Research Institute, and the University of Illinois.

Weather Forecasting

Definite uses of Illiac have not been determined, but likely non-military projects might include weather forecasting, ecology studies, and agricultural planning for entire small countries.

Military projects will probably include: ABM feasibility studies; the Phased Array Radar Operation, a program which would correlate many radar sightings of the same object and determine if it were a missile or just a decoy; and studies of shock waves in fluids, which would relate to both weather and the effects of bombs.

Too Fast to Work Alone

An unusual aspect of Illiac is its speed. It can only be used efficiently in conjunction with other computers. Much as man uses an adding machine to do his arithmetic but does everything else himself, these computers would handle all normal program functions and only turn to Illiac for massive computations.

What makes the Arpa net unique is that a user at, say, MIT can use a program at Stanford without rewriting it to suit his own computer. The MIT computer would begin work, automatically transfer the problem to the Stanford computer to use that program, and automatically return it to MIT to finish computation.

Liability Limit Insistence Costs Univac Major College Contract

LOS ANGELES – Univac's insistence on adding a clause which would limit its liability for losses that might be incurred by the user due to machine or services failure has cost it a major contract in California.

The contract with the California state colleges was for four 9200 systems, one 9300 system, and possible follow-ons. The standard California contract does not place a limit on manufacturer liability and Univac insisted upon inserting a clause. After three months of negotiation, the deal was called off and IBM picked up an order for six 360/20s with an option for four more.

The order was considered particularly significant as it would have given Univac an impressive entry into the California education market. James Farmer, director of information services, California state colleges, said he was amazed by Univac's position which in effect, eliminates the company from any competition for California state contracts. Univac refused to comment on the contract or on its liability policy.

"Liability" has been a hazy area in the computer industry. Recent lawsuits awarding damages to customers have been interpreted by some observers as establishing a valid precedent. It is believed that fear of being burned is the reason for Univac's insistence on modifying the contract.

An important question that remains unanswered is whether Univac is taking an across the board stand absolving itself from responsibility for user losses and whether this position will become a new element in other relationships.

The amendment to the standard state agreement that Univac attempted to make is as follows: ". . .In no event shall the contractor be liable for any indirect, special, or consequential damages such as loss of anticipated profits or other economic loss in connection with or arising out of the existence, furnishing, functioning, or the state's use of any item of equipment or services provided for in this agreement."

The California state colleges operate a computer network for all their schools that is composed of CDC 3000 series computers serving as master configurations while the Univac, and now IBM, computers are intended for remote job entry sites. Control Data signed the standard California contract. Although IBM is still in contract negotiations and unable to comment, it is expected to sign the standard contract.

A primary concern to the state colleges: If the machines failed during registration time and service bureau or other outside help had to be obtained under emergency conditions, would the state be reimbursed by the manufacturer for costs incurred? As one observer put it, "As a taxpayer, I'm glad the state takes this position, but I can see why Univac would want to limit liability."

Planned Errors Cost $1 Million

(Continued from Page 1)

four years.

A spokesman for the Queens district attorney's office said that almost $900,000 was taken from the National Bank of North America and a Queens branch of the Banker's Trust Company.

Bankers Trust said that its loss amounted to $440,000. The full amount of this loss was covered by federal insurance, the bank said.

Officials of the National bank of North America would not comment on the case.

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RCA Unbundles; Offers 6-Year Lease

(Continued from Page 1)

or purchase without systems support.

Systems support is the only RCA service that will be affected by the move. Education, site planning, debugging time, and software will be provided "free" whether the user chooses the bundled plan or the unbundled plan.

Unbundling Outlined

If a customer chooses to lease or purchase RCA equipment without the systems support, the 3% price reduction will apply to his entire computer system, RCA said, not just the central processing unit.

For customers choosing this route, RCA will offer systems support at a rate of $24 per hour per man, the firm said. RCA expects that nearly 20% of its customers will take advantage of the option to receive the computer systems without systems support.

These users, RCA said, will be primarily in the larger installations that are equipped to handle their own systems support services.

The smaller user, or the beginner, who wants to receive systems support services will be able to do so under the optional plan. These users will pay the present lease and purchase rates for the RCA Spectra line.

Whichever option a user chooses, he will still receive education services free of charge, in addition to software and other support services. Many IBM users felt that the loss of education was one of the worst aspects of IBM unbundling, according to a recent *Computerworld* survey.

While the final RCA systems support contract has not been determined, RCA sources said that it would not have features found objectionable by many users in the IBM and Control Data contracts announced earlier.

Specifically, RCA will not claim a proprietary right to any programs of data developed while its systems support people were working at a customer site, the RCA source said.

DP Job Market Shaky in LA Region

(Continued from Page 1)

was consulted. Director John Adams, said it is getting tougher but is not yet a crisis.

Adams said that it has 13 people right now who are looking for jobs and that this is the first time the center has had trouble in placing them.

He pointed out that out of 197 people it has trained as keypunch operators, computer operators and programmers, it has placed 174. Further, the job retention rate of 1/4 of the graduates who were surveyed was 88 to 100%.

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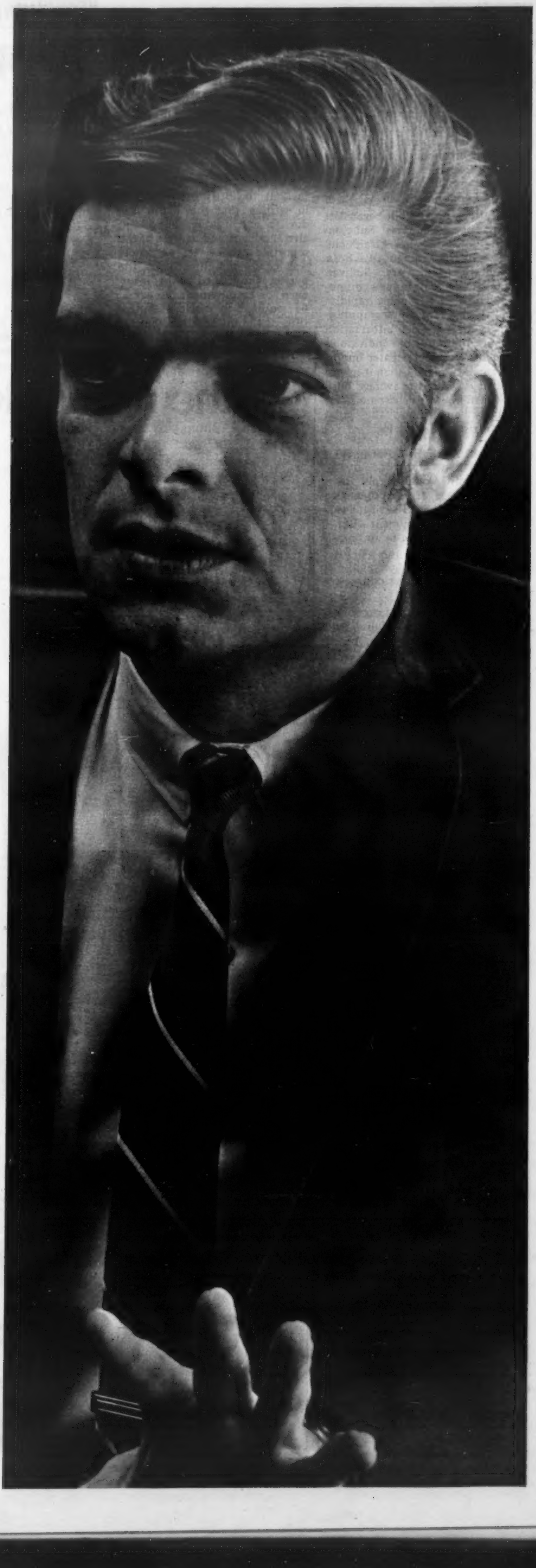


Hearings Begin on Strong Credit Bureau Rules

By Joseph Hanlon
CW Staff Writer

WASHINGTON, D.C. – A strong bill to protect the public against erroneous or malicious credit, insurance, and employers' reports has been introduced by Rep. Leonor Sullivan (D-Mo.).

Hearings on the bill began last week in the House Subcommittee on Consumer Affairs and will continue through April 8. In filing the bill, Mrs. Sullivan noted that credit bureau computerization is advancing rapidly, and warned that "the computerization of personal information about millions of individuals gives this subject greater importance and urgency than it had in the days when the average businessman knew his customers personally and knew the good credit risks from the bad."

Won't Apply to Government

The bill would apply to a broad range of "consumer reports" relating to credit, insurance, and employment. But it would only apply to businesses that supply such reports for a fee, and would not apply to government agencies or free services.

The Sullivan bill is far stronger than the Proxmire Fair Credit Reporting Act passed unanimously by the Senate last year. The credit bureaus have begun a letter-writing campaign in support of the Proxmire bill and against the Sullivan bill.

Provisions of Bill

The Sullivan bill provides that if a consumer requests it, a consumer reporting agency must:

- Show the individual his file.
- Provide a list of all persons who have received information from the file in the last five years.
- Identify the sources of all information.
- Allow the individual to add a statement disputing the accuracy, relevance, or completeness of any piece of information.
- Send such a statement to all past and future recipients of the disputed information.

End Many Current Practices

Other provisions of the bill would make illegal a whole range of common practices.

Presently, credit bureaus record the filing of lawsuits, etc., but rarely bother to follow them up and record their disposition. The bill would require reporting agencies to keep "public record information" up to date, and further would require that the reporting agency inform the person each time it reported an item of public record information.

Credit bureaus now show a person his file only if he first signs a release granting immunity to the credit bureau. The bill would make such a release illegal.

Most persons who are denied credit or insurance based on a report never find out about it. In the most extreme case, the largest supplier of insurance reports (Retail Credit Corp.) prohibits insurance agents from saying that such a report was involved.

But under the Sullivan bill, anyone who denied credit, insurance, or employment based in whole or part on a consumer report would be required, under the bill, to notify the individual in writing that the action was due to a consumer report and give the name and address of the reporting agency. If the report was conducted directly by the person who denied credit, insurance, or employment, he would be required to disclose the nature of the information that led to the denial.

The bill would prohibit anyone from conducting an investigation relating to credit, insurance, or employment without first disclosing to the person the nature and scope of the investigation and getting his written permission. In particular, the individual would be shown a copy of the questionnaire or form to be used by the investigator.

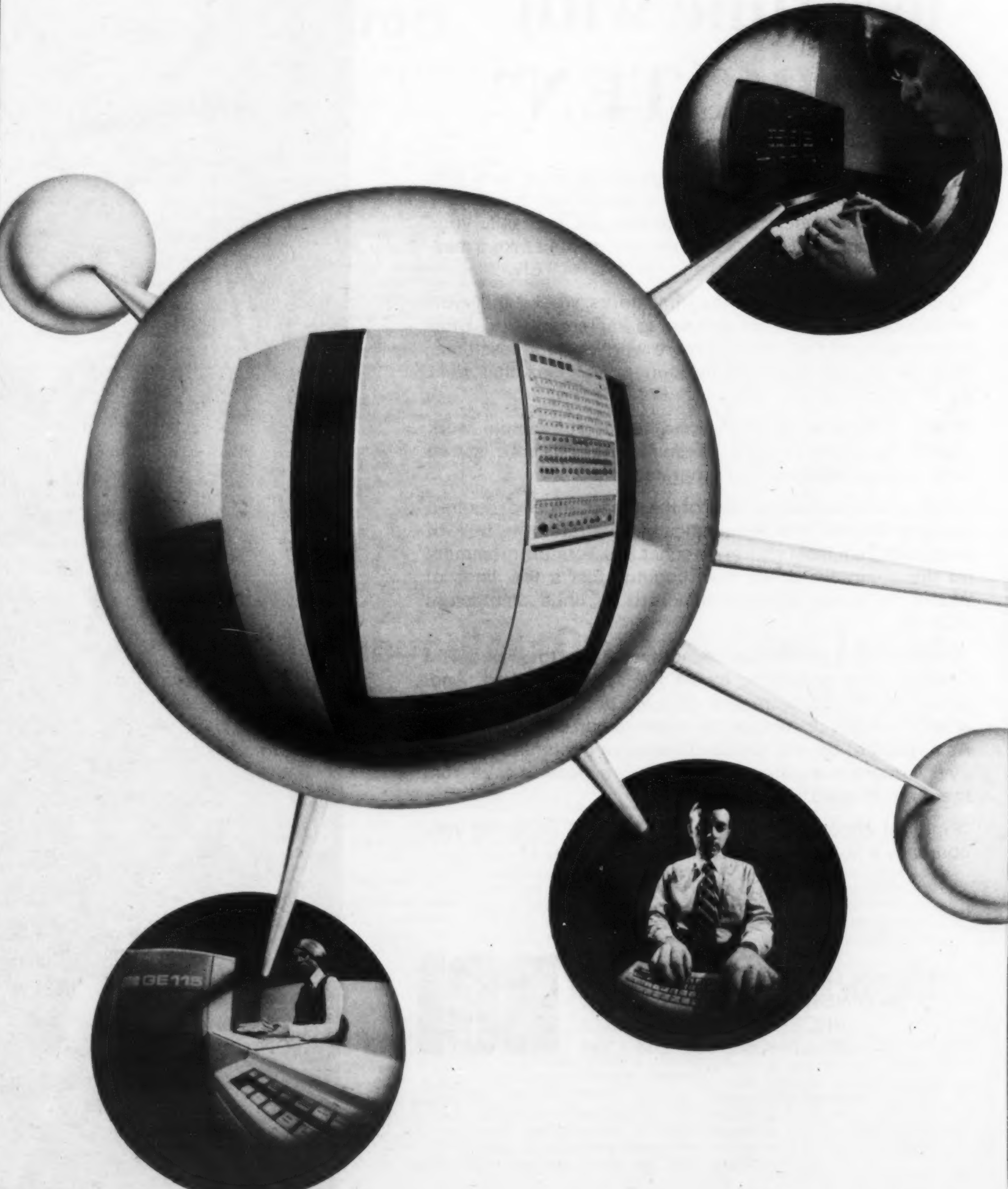
Could Collect Damages

The bill would also allow persons to collect damages, and in some cases lawyers' fees, in case of reporting agency error.

Finally, the bill would have the board of governors of the Federal Reserve System decide whether information reported is "reasonably relevant to the purpose for which it is sought" and decide if such information "constitutes an infringement of the individual's right to privacy."

The board is given the right to pass on all forms, questionnaires, "or other devices" used by consumer reporting agencies, and agencies are encouraged to submit such forms and questionnaires to the board for prior approval.

Credit reporting legislation seems to be following the same course that the Truth in Lending Bill followed two years ago. At that time, the Senate unanimously passed a weak bill. Mrs. Sullivan's committee rewrote the bill completely, making it much stronger, and her version of the bill was the one finally adopted. Similarly, the Senate has adopted the weak Proxmire Credit Reporting bill, and Mrs. Sullivan has called for a much stronger one.



NBS Says DP Errors Caused by 'Nonsignificant' Codes

By Edward J. Bride
CW Staff Writer

GAITHERSBURG, Md. – Code "44" may mean "Rhode Island" to a computer–but not to a human, according to the National Bureau of Standards (NBS).

So when "44" is used instead of "RI," the NBS says the number of input errors jumps dramatically.

Inaccurate data bases result when such "nonsignificant" data codes are used, according to NBS researcher Harry S. White Jr.

He says that the tendency to use all-numeric data codes is undergoing scrutiny by the NBS and other institutions interested in standardizing codes.

"We made a big mistake when we came out with the first federal standard, the two-character numeric code for states," White says. "The two-letter code used by the post office is better."

The two-letter code is supposed to precede the ZIP code on all mail. The contention is that a person can more readily determine that "MA" is Massachusetts, and "ME" is Maine, than "44" is Rhode Island.

A coding error in a New York State Medicaid report caused readers to think that one doctor had received nearly $1.5 million for services last year.

A spokesman for the Senate Finance Committee, which reports on Medicare and Medicaid expenditures, explained that a numeric code for "individual practice" had been entered in place of the code for "hospital-based services."

White notes that humans cannot record, process, and transfer long strings of characters as efficiently and reliably as a computer. The "human element" must prevail when tradeoffs are necessary, he says.

See Data Significance

Besides using "significant" characters in codes, White says that data fields should be simplified so that users can see the significance of manipulated data without always referring to a lookup table.

Hyphenating a field with five or more characters would provide one means of simplification.

Using significant codes would be better, like 14JU or 0614 for June 14, rather than 0165, which is the Julian or numbered date (except during leap year). The Julian date is just as logical, but not as handy as a "significant" date, since few people can memorize the table of Julian dates.

Errors apparently increase disproportionately with the complexity and size of a nonsignificant field.

A user who is familiar with a report format would probably have no trouble identifying "RIKNT" as Rhode Island's Kent County. On the other hand, assuming the same format but with nonsignificant codes, "44003" would be relatively meaningless without a lookup table, and even then a user could not be positive that a keypunch operator didn't mean "44002" or that he didn't read 44008.

It would be easier to read and remember the field if it were broken up: 44-002, but it would certainly be more meaningful to use alpha characters.

Since there is no King County in Rhode Island, a keypunch error reading "RIKNG" would undoubtedly be interpreted as "Kent," or rejected entirely, thus eliminating a source of error.

Accommodate Human Element

According to White, the establishment of significant data codes is important to the user paying the bill or specifying his needs to the DP organization.

He won't have to "bow down" to a programmer who insists that "it can only be done this way." White says that programmers would be forced to work harder to accommodate the human element.

Because "what is now good for the machine can provide unreliable information," White says that significant data codes will establish more reliable data bases.

He says that there are many people doing research in laboratories and DP surroundings. The result of research in cybernetics – the human being in a computer environment–he says, will be "a criteria for the people who are developing codes," something which has not existed in the past.

He hopes that lookup tables may some day be virtually eliminated, or, in cases where they are needed, "the alpha character will be predominant."

White is director of the data standards and applications branch of the NBS Office of Information Processing Standards.

He is also chairman of a subcommittee studying representation of data elements under the American National Standards Institutes Committee X3, Computers and Information Processing.

White is seeking user ideas in the area of data elements, and says that users interested in contributing to the effort should write to him at the NBS, Washington, D.C., 20234.

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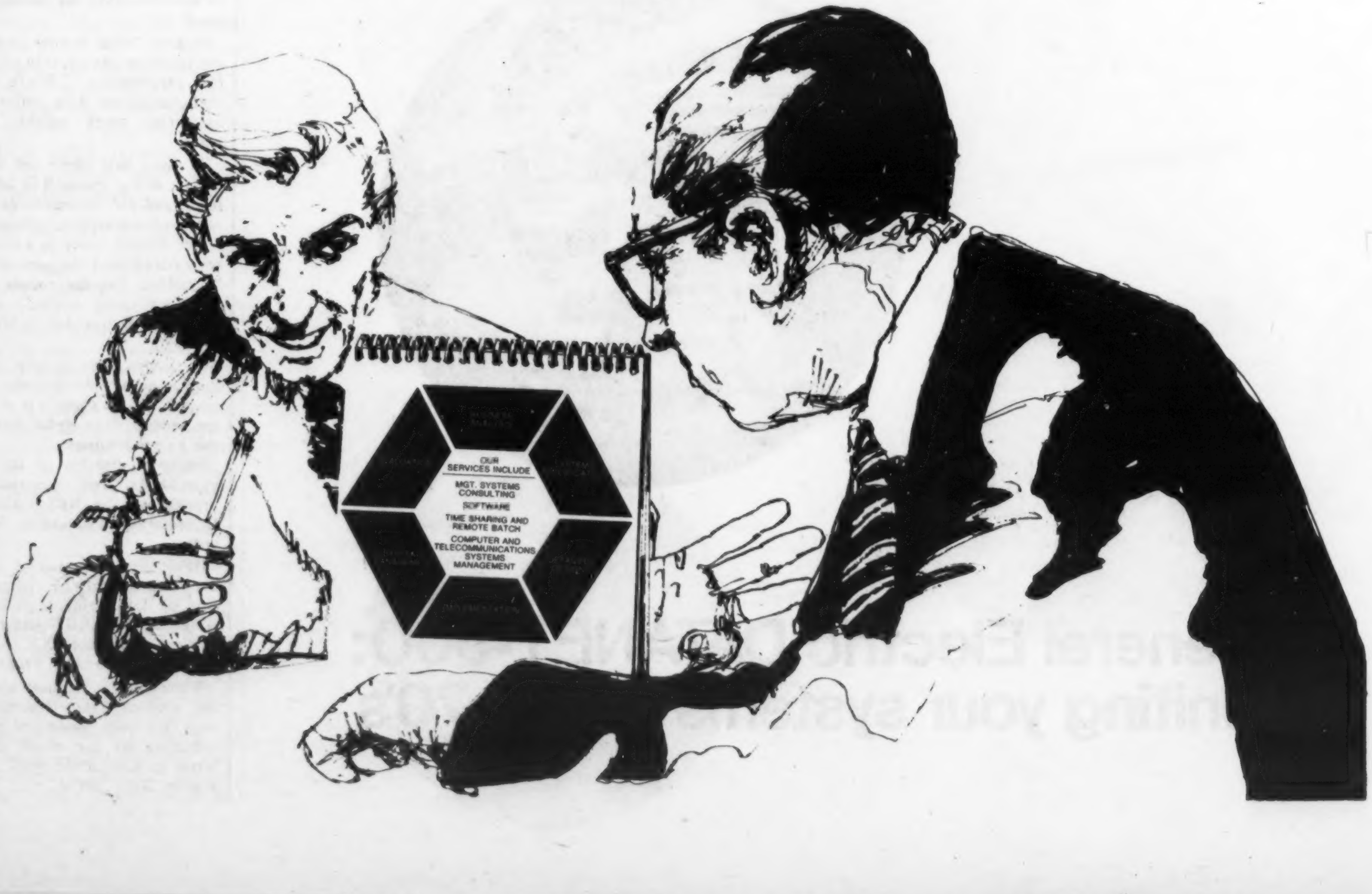
We may be able to suggest a computer configuration that, in combination with our terminal computing services, will meet all your needs with much less expense.

You may want to explore the potential economies of our providing you with a complete information systems management service.

Certainly that's a rather sketchy description of the country's most complete computer service company. To find out more, write Westinghouse Tele-Computer Systems Corporation, Three Gateway Center, Pittsburgh, Pa. 15222. Or phone Steve C. Mullé, Vice President-Marketing, at 412 255-3851. It might be the smartest move you've made today. WH-3-70

You can be sure...if it's Westinghouse



Johnson Says Data System Should Meet Users' Needs

By Ronald A. Frank
CW Technical News Editor

WASHINGTON, D.C. – Nicholas Johnson, member of the Federal Communications Commission, last week called for the commission to promote a common carrier communications system with a "maximum flexibility and adaptability to the needs of those who would use the system."

In citing current problems before the commission, Johnson said the FCC should explore how the present communications system can be made more useful "to all users" instead of exploring why "established interests [should not] be permitted to protect monopoly markets and traditional market shares."

He added that "entities who propose to retain or implement restrictive barriers to use of the [existing communications] system" should have to meet "a very heavy burden of showing why restrictions in interconnection, foreign attachment, sharing, and resale of facilities should be permitted."

Johnson's statements were part of a speech prepared for delivery in the "Computers, Communications and the Public Interest," series sponsored by Johns Hopkins University and the Brookings Institution.

In dealing with the question of technical competency on the part of the FCC and its staff, Johnson said: "The FCC's handling of major technological questions leaves much to be desired. Typically on a matter as complex as the computer inquiry, the commissioners will have almost no independent knowledge or expertise of their own." He added that the FCC has no separate staff policy planning function and said the commission must rely on the findings of the Common Carrier Bureau for "policy questions, the alternatives, and the procedures," which are presented as a package for adoption or rejection.

Johnson said that the FCC "very seldom . . . [has] sufficient data to analyze intelligently a difficult problem." He added that this was due to obsolete practises and a failure to employ the most advanced techniques and technologies.

"No top FCC policymaker regularly uses any computer system as an aid to decision-making," Johnson continued.

Johnson said that the question of privacy presents "special problems of great urgency."

"How does a computer tell someone who calls it that it doesn't want to talk to him? What about unauthorized interception? These, and related concerns, worry the average American more than his elected and appointed representatives or the data and communications industries. That is a mistake. The fair resolution of such concerns are vital to the continued good health of both industries," Johnson said.

"The usefulness of the telephone system for voice or data depends in significant measure on the presumption that telephone conversations can be conducted in private. The commission might well begin a separate legislative inquiry into all aspects of privacy," he said. He added that up to now questions concerning privacy have been deferred by the commission.

Communications

In speaking of the computer inquiry being conducted by the FCC, Johnson said that unique issues were involved.

"The question was at least asked whether a whole new communications system was needed for data communications. The assumption that the telephone system was the best 'Anywhere, Anytime, Anything' network was challenged. Many of the responses expressed the opinion that telephone carriers could not do the job," Johnson said.

In discussing possible uses of a national cable TV network, Johnson said: "Once a national network is installed, especially if it has switching capability, we would have created an alternative to the telephone company with an information-moving capacity to make Ma Bell look like an old lady with two paper cups and a piece of string."

In dealing with the question of regulated common carriers competing with commercial computer data companies, Johnson said one policy option would be to force communications common carriers with data processing units to establish separate subsidiaries. "This might help to insure fair competition and non-discriminatory practices."

Johnson also discussed current problems of computer users.

He said it is not unusual for users of computers to find that while their computational costs are going down, their communications costs are becoming an increasingly significant share of the total cost of using computer systems. As communications becomes a significant cost center for computer usage it is natural that more attention is given to it.

Computer systems users also find themselves barred from fully utilizing the capacities of their new equipment and software systems because communications facilities are often not available at any price.

These barriers are sometimes artificial – barriers imposed by outmoded or unnecessarily rigid practices on the part of communications common carriers. But the barriers are sometimes imposed because the communications system was simply never designed for the new uses the data industry is only now demanding.

Johnson said that the FCC needs central staff policy planning capabilities if it is to deal successfully with the many problems before it.

Coupler Series Available

MOUNTAIN VIEW, Calif. – Anderson Jacobson Inc. has available for immediate delivery a series of acoustic couplers and modems compatible with its 103A Dataphone.

The company said that the couplers offer a cup made of flexible rubber which allows different type telephone handsets to be easily inserted while providing both a positive mechanical connection and an acoustic shield. The handset floats within the acoustic cups making it resistant to shock and vibration, the company said.

With a Teletype 33 interface, the 240 series coupler costs $375. Units with RS232B interface and with both TTY and RS232B interface are also available.

Anderson Jacobson Inc. is at 2235 Mora Drive.

Editorials

Humor Lightens the Burden

The Clifton Springs (N.Y.) Hospital and Clinic has approached computerized billing with a sense of humor – and thereby has earned national publicity.

Unfortunately, United Press International, in filing a story to its subscribers, missed the point.

To let patients know that there may be problems with computer-prepared bills, the hospital is sending out a cover letter announcing the new system.

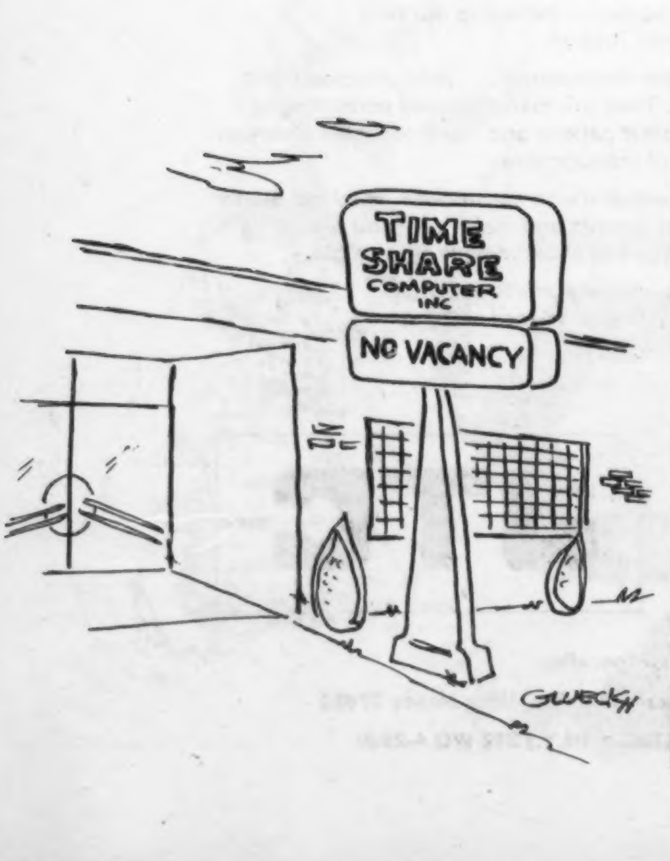
To stress the fallibility of the system, the letter notes that the bill was "untouched by human hands, human hands, human hands, human hands, human 1@#$%/%$#."

The letter concludes: "In case of error, do *not* contact our *computer*! Instead, please write to . . . " and the name and address of a human being are listed.

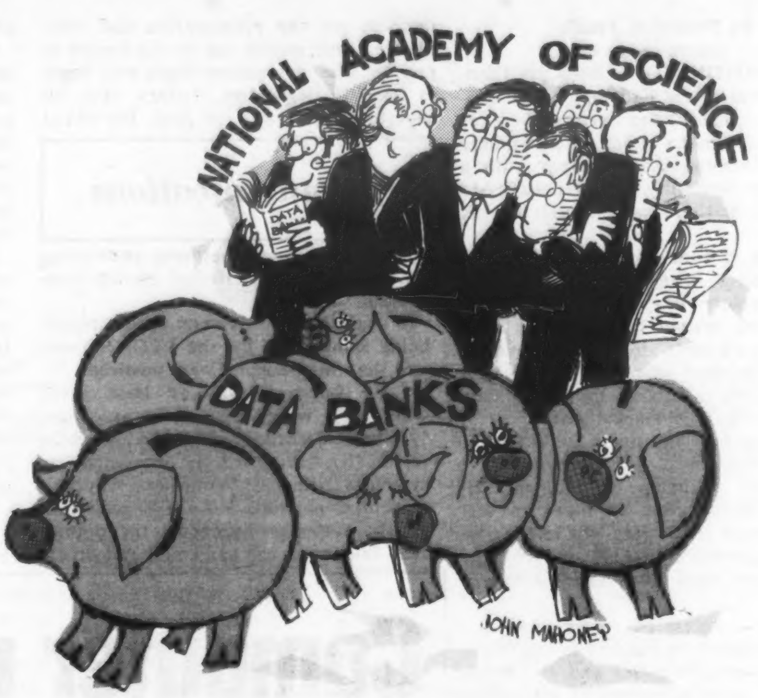
We congratulate the hospital for taking the effort to make the new system seem less impersonal.

However, we are sorry that UPI, in writing a story about the letter, failed to explain why it was prepared. The wire service also managed to give the impression that the "mistakes" in the letter resulted from the letter being written by the computer, which it was not.

But the letter should go a long way toward heading off angry complaints about erroneous bills. The letter explains what the hospital is doing, why it is doing it, notes that things may go wrong in the beginning, and explains what to do when things do go wrong. The humor, thrown in as an afterthought, doesn't hurt one bit.



1970 Census



Letters to the Editor

Used Computer Market Should Not Be Overlooked

In your Feb. 25 issue, you [discussed] plug-to-plug compatible components for IBM equivalent components. I wish to point out to you that there is one market which is completely plug-to-plug compatible, and is selling at prices less than any other plug-to-plug compatible systems offered by other equipment manufacturers (other than IBM). This market is the used computer systems market.

As you recognize, plug-to-plug compatible systems usually copy computer components that are frequently obsolete at the time of announcement and availability.

In the used computer market, the price of IBM components are priced at less than the equivalent plug-to-plug compatible unit. These systems are acceptable for IBM Maintenance Contract coverage. There is no problem relating to maintenance or acceptability by the original equipment manufacturer, specifically IBM.

The important factor in this particular market is that the resale value of the units are maintained rather than having one where the residual value is questionable.

There are three advantages of the used computer market components versus the plug-to-plug compatible components. Specifically, the price is less than any comparable unit offered by plug-to-plug compatible; the maintenance is with one manufacturer where reliability and dependability is established; and the residual value of such components is established in terms of future marketability and obsolescence.

In the area where price is important, dependability is required, and credibility is established, the used computer market in the components is a proven and established alternative to the other plug-to-plug compatible OEMs.

The prices, reliability, and responsibility are established with the OEM, specifically IBM.

It is impossible to beat the used computer market for establishing criteria of value in the plug-to-plug compatibility area. This is our specialty.

George S. McLaughlin Jr.

George S. McLaughlin Associates, Inc.
Summit, N.J.

Computer Industry Needs Independent Service Firms

The cartoon captioned, "It's Really A Job For One Man," [CW, Feb. 11] sounded a clarion call to the EDP industry that has long suffered from a disease known as "Finger-Pointing at the Interface."

An independent specialist in systems diagnosis and trouble-shooting as well as product repair, provides a significantly more effective and economical solution to an end-user's hardware problem than can a battery of company technicians, each of whose knowledge of the system stops at the interface to his particular component.

This is the vital need within the industry that is being fulfilled by SirVess, Inc., and other independent service companies, who provide single-source maintenance to systems companies and end-users who may now assemble their systems from the best components available for the purpose, rather than from a single manufacturer.

Thank you for presenting the message so well.

Gene Snelling
General Manager

SirVess, Inc.
Saddle Brook, N.J.

There Is No 'Squabble' Between ACM and Afips

I was sorry to see the article that you published on the National Computer Year [CW, Feb. 18]. I assure you that there is no "squabble" between ACM and Afips. I rather believe that a series of small misunderstandings and lack of communication has been allowed to escalate until there appears to be a division.

As far back as September of last year, Dick Tanaka, president of Afips, wrote to me that "the idea of a National Computer Year is one which is generally agreed with and one for which essentially universal support seems to be available . . . It would be damaging if done without the full support of all of the major organizations in the computing field . . . From all that can be gathered during the discussion [in Afips], it appears very possible to enlist the full support of Afips, its constitutent societies, and a number of other organizations as well. I would be happy to serve as the contact point to initiate such action within Afips." I have seen no change in his attitude, and I believe Afips will be fully cooperative in the efforts to organize the Computer Year.

Bernard A. Galler
President

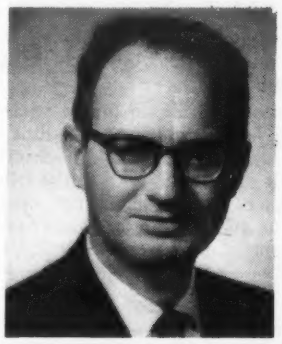
Assn. for Computing Machinery
New York

Computerworld welcomes comments from its readers. Preference will be given to letters of 250 words or less. *Computerworld* reserves the right to edit letters for purposes of clarity and brevity. Letters should be addressed to: Editor, Computerworld, 797 Washington Street, Newton, Mass. 02160.

At Last – Results From Measurement

The Taylor Report

by Alan Taylor



The proof of any pudding is in the eating, and while many of the current types of measurement devices have excellent theoretical qualifications – and can be described at great length – there has been a major scarcity of actual success stories. But we are receiving a few now.

One of the best, and one of the most illuminating success stories, comes from the Small Business Administration in Washington, D.C. The SBA has the job of administering loans and loan guarantees that have been granted to small businesses throughout the country. Like any government department, it also has the duty of seeing that these are efficiently and effectively handled. To do this the SBA uses two Honeywell machines, a Honeywell 1200 with 32K of core and six tape units, and a Honeywell 2200 with 230K of core and six tape units. Eighty per cent of the work is handled in Cobol with some Fortran programs also being run. The Fortran programs are primarily for running statistical examinations of a data bank on the history of previous loans.

One-Day Course Started It

Recently Gerald Rosenkrantz of Computer Management Sciences, Silver Springs, Md. (not to be confused with Computer Management Aids, the company that we have here in Framingham) held a one-day course at the SBA. As John Catale, chief of the SBA's Resources Management Branch, told me, it was the first time that he had heard of a course which really connected the hardware and software together. During the course, Rosenkrantz dealt with the characteristics of the Honeywell Cobol H compiler when running on a Honeywell 1200 system.

Running Programs Changed

As a direct result of the course, two programs that were then operating have been changed. One of them was reduced from a running time of about three hours to one hour and a half, a 50% reduction time, which pleased Catale very much. However, he noted that in fact the type of improvement used had been suggested specifically for the program by Rosenkrantz, although it had been carried out by one of SBA's programmers.

Even more pleasing was the story of another program that was improved without any aid from the instructor. John P. Hightower, Jr., another SBA programmer, checked through a number of programs and found one that was heavily subscripted. The program, AOR 17, uses a 136-element table lookup.

After an investigation, John reduced the amount of time for table lookup by first testing for the most-used items. It turned out that over 90% of the work fell in four of the 136 entries.

Test Results Equal Final Results!

A week after the original course, John had made some test runs on 15% of the file which indicated that the computer runs should be finished in about a third of the original time, and later, after the new program was adopted, it was found that the whole run had been reduced from seven hours to about one hour and 50 minutes.

Technical Results

Clearly then the course had helped. Frank Kubick, of the SBA, told me that he was very satisfied with the emphasis it placed on cost effectiveness. This, he felt, was necessary for programmers if they were to produce the necessary efficiency that management wants. He also said that he hoped that in the future, managers, as well as programmers, would tend to expose themselves to similar types of courses. (Sounds just like a programmer, doesn't he?)

Management Results

And it appears that so far as SBA is concerned that is exactly what is happening, because the management results were well brought out by Catale. Catale said that from a manager's point of view he had never had the knowledge that any specific program was or was not efficient, and therefore he could not locate for the programmer the areas where attention was needed. He had to concentrate on getting programs into operation – not on determining if they were running overtime. Now that he knows some ways of doing it, he intends to give a lot of attention to this area.

Those are real results.

Computers such as this tape Honeywell 2200 have very exact performance times published – but whether these times are really relevent in this day of Cobol, Fortran, etc., programming appears to be very doubtful, judging by the experience at the Small Business Administration.

Update on SicEval

The SicEval meeting in Philadelphia that was considering closing down its newsletter [Taylor Reports, March 10] did agree to continue to circulate their meeting notices and data when I went down and asked them to do so. But there was considerable doubt about whether it was really worthwhile. Saul Stimler, chairman of the group, said, "I haven't had a single reaction from anyone. We send them out to all parts of the country, and many foreign countries, and no one either complains, praises, or does anything!

"If the data is of any interest to them, why don't they write and tell us how they use it? And if it isn't any use then why don't they have the courtesy to tell us that?"

He has a point. Actually the write-ups are mainly interesting simply to know what is being discussed. The amount of detail given as to the results, techniques, problems, etc. is pretty poor, and the SicEval group itself is one of the first to criticize their quality. However, they also – quite reasonably – see little value in doing anything about them if no one is interested.

I think that people should be interested. I think people outside the Delaware Valley have something to contribute to the group, and I think that people in the group have something to contribute to those outside who are interested in performance. And judging by the SBA experience, they can profit by being interested. If you agree, why don't you write to Saul Stimler, Stimler Associates, 189 E. Main Street, Moorestown, N.J. 08057, and if you don't agree, why don't you write to me and tell me so!

New York Course Dates

Some people have written to me asking about the computer evaluation course to be held in April in New York City, which I mentioned in the Feb. 11 Taylor Reports. The details, in case other people are interested, are that the course is being held on April 22 and 23, that anyone can attend who can pay $250, and that applications should be addressed to Computer Learning, Inc., 6201 Leesburg Pike, Falls Church, Va.

"I Don't Want to Talk to Any Bungling Human – Let Me Talk to Your Computer."

The Case of the Badly Maligned Keypunch Operator

By Carl Hammer
Special to Computerworld

Everybody knows that keypunch operators make mistakes. We appreciate the difficulty, monotony, and even boredom associated with this important function and also the disastrous consequences which an occasionally mispunched card can cause. It is not often that we have the opportunity – and time – to take a closer look at keypunching and analyze this interactive man-machine process. This brief story may offer some new viewpoints and a few interesting results.

It all started rather innocently. During the first week of September we received a data list with 2880 four-place integer entries ("Format (Ix,12(I4,2X))") in 12 columns and 240 rows. The job: keypunch 240 cards from this listing. We sent the document to our EAM shop asking for cards and listing. Both were received the next day and we proofread them, corrected the mispunched cards, and ran the data deck with great success; but that is another story.

Numerous red circles on the keypunch listing suggested rather forcibly that we had here a unique piece of evidence allowing us to analyze the (unknown) keypunch operator's work. It would also help us dispel some misconceptions which seem to exist in the minds of many EAM customers.

First, look at the overall statistics: the job involved punching 240 cards, with 12, 4-digit fields in each. One hundred-ninety-eight cards returned to us were completely free of error; 37 cards had errors in one of the 12 fields; 5 cards contained two errors. Thus we concluded that 17.5% of the keypunched cards were in error.

But, this viewpoint ignored the fact that each card had 12 field entries and certainly not all of these were wrong! So, we started all over: of the 240x12 = 2880 four-digit entries, only 47 or 1.6% were in error. Now our girl begins to look much better! Yet she might take an even more detailed view of her work and point out that not all digits in the 47 erroneous items were punched incorrectly. In fact, 42 entries erred only in one digit; four of them had two digits mispunched; only one contained three errors.

Thus, our operator had mispunched 42x1+4x2+1x3 = 53 out of 2880x 4 = 11520 digits, or 0.5%. At this point our (unknown) victim might claim that she still did not have her day in court. After all, her job involved the processing of 240 cards with 80 columns each for a total of 19,200 positions. Calculated on that basis, the 53 mispunched digits represent only an error rate of 0.3%!

Which of these error rates you like depends very much on what you are trying to prove. Taken out of context, they are all meaningless. So, the next time you hear of a 3% keypunch error rate – start asking questions!

Since we had accumulated all this evidence, it seemed a shame to stop here. What else could we say about our young friend in the EAM department? Had we learned anything about her personal "Signature," her idiosyncrasies and preferences? Indeed we had; here are some of the things we discovered.

First, our friend is prone to commit errors in certain, preferred fields. Distribution of the 47 errors, from left to right, across the 12 card fields shows error counts of 3, 5, 1, 6, 6, 1, 5, 6, 5, 5, 3, 1 respectively. Significantly better error levels obtain for fields 3, 6, and 12 than for the others.

This may be a result of her reading habits or other psychological factors active in her as she toils on her 029 keypunch . . .

There was no significant trend in the operator's treatment of the four digits in each field. Most of the four-place numbers started with 1 or 2 and it is not surprising that she committed no mispunches in the first, most significant, of the four columns in each field. The numbers of errors in the second, third, and fourth position, respectively, are 15, 19, 19 for the old total of 53.

However, there was a definite way in which there errors were structured; it can be traced to the design of the keyboard and arrangement of its keys. Here is a detailed tabulation of the types of errors and their frequencies:

Error	Frequency	Typed	Instead of
-3	19	1703	1706
-2	4	1740	1742
-1	3	1516	1526
+1	4	1920	1820
+2	1	1872	1672
+3	13	1773	1770
+5	1	1258	1253
M	4	138-	1380
T	2	1864	1684

If we look at the position of the keys, the location of keys with the most frequent errors shows a definite pattern.

Our operator exhibited also significantly different responses to the 10 different stimuli offered during this task. The 53 individual errors, made for inputs ranging from 0 to 9, have the following frequencies: 5, 0, 6, 10, 5, 1, 6, 3, 7, 10. Thus there is a clearcut preference for errors in the rightmost column of the numerical key section.

Fatigue and response to repetitive tasks have been the subject of much analysis by psychologists and other professionals.

Thus it was also the case with our keypunch operator who erred (after a good start) in cards 36, 38 (2 fields), 48, 56, 58, 59, 60, 65, 66, 70, 71, 74, 76, 78, 83, 90, 95, 97, 100, 101, 108, 123, 124, 144, 156, 159, 160, 166, 168 (2 fields), 183, 186, 187, 189, 195, 206, 210, (2 fields), 226, 227 (2 fields), 231, 232, 233, 236, (2 fields).

Correlative autoregression on this seemingly random set of 42 numbers reveals our operator to operate along significant cycles of length 2, 4, and 6. Why! Well, that is the way the input document (computer printout blocked every six lines) was layed out. Our keyboard artist made 2, 5, 6, 9, 9, 16 errors respectively as she copied from lines 1, 2, 3, 4, 5, 6.

Note how her internal pressure builds up toward the end of each block, rising to a crescendo in its last line!

Well, you probably never thought much about interactive systems, (wo)man-machine interfaces, and the analysis of subconscious, psychological mechanisms. Now you have an example, of sort. It teaches us a great deal, about the person, her work, and the ways in which we can make her job easier.

Whatever our station in life or society may be, we have an obligation to think of fellow-workers as individuals. Studies such as this might help improve the lot of the thousands who, as keypunch operators, are the really unsung heroines in our age of automation. Any comments?

"Didn't Have Time to Change . . . He Wanted Me to Start Work Immediately."

An entirely new class of software?

"With CULPRIT you may never write another report program. It'll be as out of date as writing a sort!"

CULPRIT (CULL and PRINT) is the first of a new class of software. Think of it as a report *utility*. The concept has been used only rarely before and never with the tremendous versatility of CULPRIT.

If you've been considering the use of any kind of report generator and information retrieval system, you're thinking in the right direction. But beginning today, anything you might have looked at is woefully out of date!

Many report generators can produce only one report from one pass of the data file. Others produce a Cobol program which must be compiled, link edited and run before they produce a report. Some even have both problems. That's Model T designing!

CULPRIT is a parameter-driven program. No compiling needed. The program is kept on the core image library like a utility and produces a report as directed by the parameter coding. Highly efficient, it produces many reports (up to 99) with a single pass and can extract from multiple input files.

CULPRIT requires from 1/10 to 1/40 the normal coding time. This means that the most junior-level programmer can request and get a simple one-time report in minutes. Or many complex reports in *one pass* . . . with just a few hours of coding. Not weeks. Hours! But fast reports are not all new CULPRIT can do for you.

New Systems: When you design a new system, how much of it is made up of report editing programs? Half? A third? Then you can put your new system on the air nearly one-third to one-half sooner by simply plugging new CULPRIT into the system to handle the reporting requirements. You not only save programming time, but the machine time usually needed for debugging this part of the system.

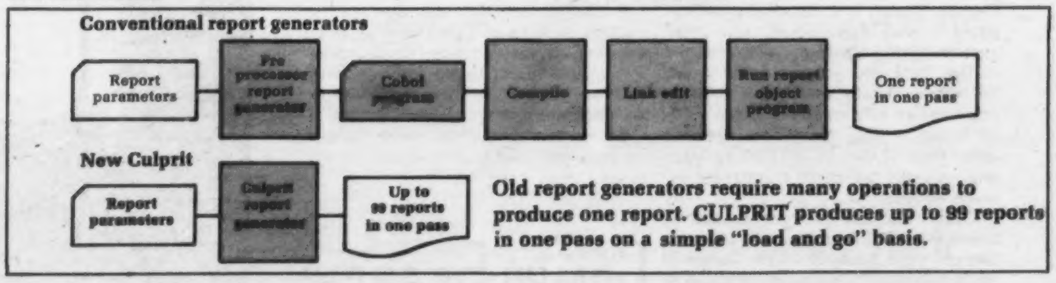
Processing speeds are close to those for well-designed and laboriously hand-coded programs. Remember . . . this isn't an ordinary report generator. You just load and go.

Features: CULPRIT has multi-line output for address labels, notices, etc. Other options include header variables; multiple-lines in headers, detail and totals; separately specifiable total lines; calculation ability on both detail and total levels; use of mnemonics for working fields; and many others. Output may be printer, punched cards, tape or disk . . . permitting program and test file creation and conversion.

Development: CULPRIT was designed by Gilbert F. Curtis and Anna Marie Thron. These are the same people who designed, implemented and installed some of the most successful application systems ever produced . . . systems now in use by many scores of major corporations.

Support: When we provide user and management briefing, hands-on instruction, or modification and backup, we work from an intimate knowledge of your day-by-day business needs as well as from a strong technical EDP base. Our people are experienced in dozens of major industries. You won't find a green hand or an ivory tower type on the Cullinane staff!

It's your move now! Send us a routine inquiry and you'll get a complete 14-page technical report. But if you're *really* interested, call us at (617) 742-8656 and discuss CULPRIT with a member of our technical staff.



Old report generators require many operations to produce one report. CULPRIT produces up to 99 reports in one pass on a simple "load and go" basis.

Cullinane Corporation

60 State St., Boston, Mass. 02109 Phone: (617) 742-8656 Other offices in New York, St. Louis, and London.

Smoking Monkey Helps Science Predict Drug Effects

ROCHESTER, N.Y. – A group of laboratory animals, including a monkey who puffs on cigarettes, is being "watched" by two computers in an effort to understand, predict, and control the effects of drugs on behavior.

Dr. Bernard Weiss, of the University of Rochester's department of radiation biology and biophysics, uses one of the first classic Linc computers made, along with a PDP-8 and a new PDP-12 to monitor animals' activities during behavioral experiments. When the experiments are completed, the computers analyze the data they have accumulated.

The three computers are connected to a number of experimental chambers where animals do various tasks. They interpret a variety of input signals from the onset of experimental activities such as the intensity of a bite, the duration of a reaction to a stimulus, the volume of a cigarette puff, or the interval between responses.

The computer controls the schedule of reinforcement, the relation between behavior and its consequences. If an animal does a task within predetermined tolerances, the computer releases food or liquid as a reward. If the animal's performance does not meet the criteria, the computers do not release the food.

In one of the experiments, Walter Rucker, a graduate student, has taught a monkey to puff on cigarettes. Unfortunate animals used in smoking experiments often are given a tracheotomy, which forces them to inhale cigarette smoke along with their primary source of air.

The monkey in Weiss' laboratory, however, is deprived of water before the experiment, and must puff on the cigarette in order to get a drink of juice. The cigarettes are mounted on a flowmeter that allows the computer to measure the amount of smoke the monkey draws.

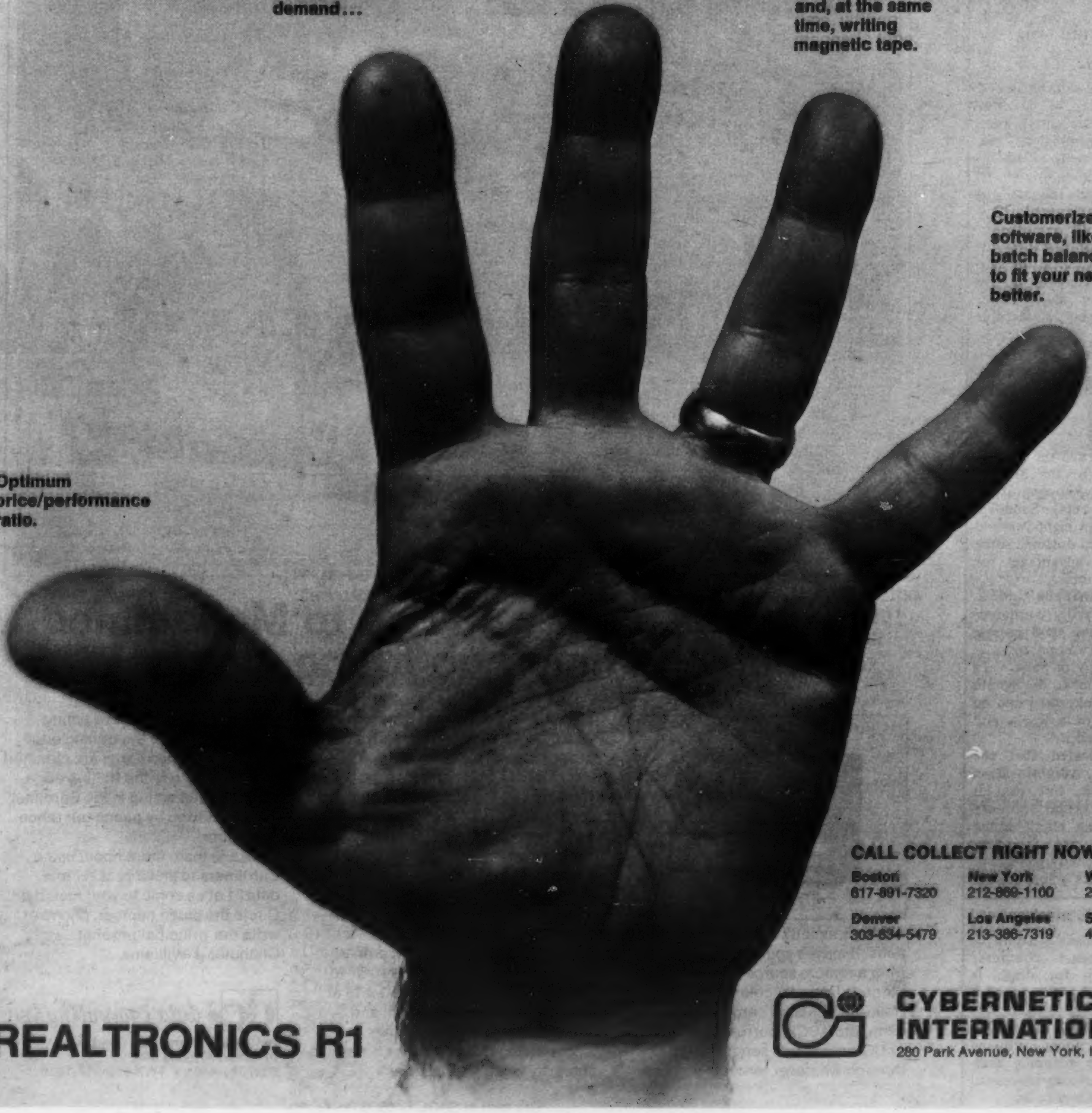
The number of puffs the monkey takes, the duration and peak rate of flow of air of each puff, and the volume of smoke he inhales are recorded on DEC tape for later analysis.

"This is a more valid way of conducting an experiment than performing a tracheotomy and forcing the animal to inhale, because the monkey's smoking is more or less 'voluntary,'" Rucker said. "It is more like the way a human smokes."

The experiment may help determine whether the amount of smoke inhaled increases with time, whether this amount is dependent on the constituents of the smoke, and whether the animal eventually will smoke of his own will without the added inducement of juice.

One of the goals of the experiments is to determine the effects of various doses of drugs and chemical compounds on the performance of animals, thereby building up a behavioral index of the potency of a drug. This will enable scientists to predict the behavior of an animal that has been given a certain dosage.

The information from Weiss' experiments is stored on magnetic tape, and is represented graphically either on the PDP-12's cathode ray tube display or by his plotter.



Dating Bureau Services in Minnesota Have Dissatisfied Mismatched Customers

ST. PAUL, Minn. – The attorney general's office here has warned individuals not to rush into a contract with a computer dating company before fully investigating the contract.

In a weekly consumer column distributed to newspapers throughout the state, Atty. Gen. Douglas Head says that computer dating may not be all that it's programmed to be.

The warning came after numerous complaints of mismatching by computer dating companies in the Twin Cities area.

In one instance, a well-educated career woman from St. Paul was matched with a lonely north woods widower who liked hunting, trapping, and fishing.

She wanted to meet a business or professional man who shared her interests, while the widower wanted someone to share his lonely country home.

A spokesman for the consumer division said that this mismatch may have been the product of an isolated computer malfunction.

"But our division has received numerous similar complaints from other Minnesotans who have invested in computer dating programs, " he said.

Stating that not everybody had been satisfied with the results of computer dating companies in the area, the consumer affairs office warned that anyone interested in paying for computer dating should understand what the company promised – for example, whether prospective matches lived hundreds of miles away.

All promises should be in writing, the column continued.

"We do not question that a properly programmed computer could successfully match compatible men and women who might not otherwise meet," the column said.

It warned clients not to rush into a contract blinded by the prospect of meeting a dream man or woman.

"You may be inviting disappointment," it continued, "for the dream man or woman will already be obtaining compatible dates without the services of a computer dating service."

Hannas Hopeful of Mate-Matching

Special to Computerworld

HAMBURG – Some 10,000 West Germans each month are turning to a computer to find them the right partner for life.

The service is being provided by a Hamburg marriage institute. Everyone signing up for the organization's special offering gets up to 99 possible candidates to look over each year.

The computer scouts out and matches people who would seem to have the trappings for making a successful marriage together. Last year, the institute sent out about 250,000 proposals with the names of matched prospects to its clients.

What subsequently happens is up to each couple, of course. But the success of the system might partially be measured by a year's results.

In 1968, the institute's program produced 2,000 marriages, 2,500 engagements and 8,200 personal contacts with high prospects of becoming permanent relationships.

To be enrolled in the program at the institute, called Firma Altmann, candidates must agree to undergo a written test, meet a counselor from the institute at home and, based on income, pay a fee of between $100 and $625.

Can Bureaus Bridge DP Gap For Small Firms?

WASHINGTON, D.C. – The "technological gaps" between small business and the computer can be bridged by service bureaus, according to the director of the Small Business Administration.

Hilary Sandoval said he agreed with Joel Bernstein, president of Information Standards, Inc., that service organizations like Bernstein's "appear to be a commercially feasible approach to bringing computer services" to small businesses.

Bernstein recently criticized a Senate Small Business Committee report which called for subsidies to these small businesses which could not justify their own data processing installations [CW, Feb. 25].

Bernstein said that "a solution to this probelm exists today" in the form of the independent service bureaus.

Sandoval received a copy of Bernstein's letter to the committee which forwarded the original correspondence to the Science and Technology Subcommittee.

Along with his reply, Sandoval sent Bernstein an eight-year-old publication which outlined some data processing advantages for small manufacturers.

Sandoval said that the publication was admittedly outdated, but still had some good points; he also promised an update.

Although a copy of Sandoval's reply was also sent to the Senate committee, a spokesman said he looked for it for a week, and "still couldn't find it."

Bernstein indicated that the Small Business Administration reply was weak, but that it contained the proper philosophy. "If nothing else," added Bernstein, "we may have accomplished a needed updating of the manufacturers' publication."

Dogs Date by Computer

TORONTO,Canada – There is now a lonely-hearts computer matching set-up for dogs. It started as a gag, but the need for the doggie dating bureau was real. Consequently, the canine computer is a going, growing machine, madly mapping matings and guaranteeing successful matches – or money back.

Communication Network Basis for Patient Care

By R.F. Littrell

Special to Computerworld

BIRMINGHAM, Ala. – Much effort is being put into the application of computer and communication techniques to medical services in large institutions and hospitals. But by far the greatest portion of medical care in this country is provided by private physicians or by small clinics.

According to a joint study by Systems, Science and Software, La Jolla, Calif., and the Southern California Medical Laboratories, San Diego, a physician using the computer-aided testing services can save up to one-third of his time, compared to present practices.

One of the companies that is providing a service for individual physicians and small clinics is Computer Communications, Inc. (ComputerComm), which has developed a medical communications network that is the basis of a major patient care system. It provides full capabilities of the computer and communications to the patient and his doctor.

Central Data File

ComputerComm's system provides a central data file for data storage and retrieval by hospitals, clinics, medical labs, and group practices. According to ComputerComm President K.G. Robinson II, "The network provides a data source to physicians, hospitals, and clinics on a real-time basis for billing, medical records, updating, and retrieval. The data is transferable between agencies on appropriate request. This service can be of immense benefit to a patient in an emergency situation."

Robinson said that there are very few people working in the outpatient environment, where they are most needed.

The ComputerComm system, Impac (Improved Patient Care), is a medical support system designed by physicians. The system is the most comprehensive data processing service developed for the medical community. Impac is intended to be a nationwide real-time information system, allowing users to process and store their patient and accounting information on a large central computer, providing a central patient profile record, providing immediate access to the computer records through telephone or communications terminals, and making patient information available to nonsubscribing medical groups and hospitals on an emergency basis or after validation of a request.

Complete Laboratory System

A complete laboratory system covering all aspects of lab reports, daily and monthly billing, insurance, and related laboratory management reports is provided by ComputerComm as part of the Impac system.

The ComputerComm network was initiated in May, 1968, organized by a group of medical practitioners. The first system served five agencies: two private medical labs, one obstetrics-gynecological group, one group of urologists, and a group of opthamologists. It has since added a group of cardiologists and a group of ear, nose, and throat specialists.

Currently the central site serves 26 terminals, including 10 hospitals within a 100-mile radius of Birmingham. The system was implemented on a Univac 418 II system, and has grown to a Univac 1106, which is currently being installed. The system provides the data storage and retrieval facilities and message switching environment for 22 physicians and 10 hospitals, with two supporting medical labs. The communications net ties them together to exchange lab reports, patient medical records, and administrative functions.

Currently under development are programs to provide an improved general insurance form for the various users, and implementation of a patient ID card imprinted with pertinent medical data.

Plastic ID Card

The ID card will be plastic, similar to conventional credit cards. The card contains the patient's name, an ID number, blood type, the party responsible for the patient, and a string of numbers designating pertinent medical data such as allergies and vaccinations.

According to F.F. Harned Jr., marketing manager for ComputerComm, the composite insurance form is designed to serve as a data source for Blue Cross, the Health Insurance Council, Medicare, and Medicaid. "All groups have accepted the form as valid when signed by the patient or accompanied by a blank form signed by the patient," Harned said. "This acceptance allows production of a standard form at 25% of conventional service costs."

Harned also described the development of a general form for hospital admissions. The form, designed in cooperation with the Birmingham Hospital Association, provides 60% to 80% of the information required by current hospital admission forms. The hospital can call up the data center for admissions form information and also receive the physicians' instructions regarding special treatments, diet, lab tests, X-rays, and other pertinent information.

Results Immediately Available

When tests are performed and analyzed, the results are immediately available to the physician, enabling him to prescribe any additional tests, thereby making the follow-on test results available at least one day earlier than present practices. Thus the patient's stay in the hospital may be shortened.

The costs for the system are spread a variety of ways. The agencies employing the services are charged for line time, terminal rent or purchase, storage of files, and utilization of the stored data on a per-transaction basis. ComputerComm will soon offer a registry service for patients to register themselves for a rate possibly as low as $2 per individual for the first year. The registry enrolls the patient, recording pertinent medical data, provides the patient with a printout of his own data, and prepares his ID card. Presently there are over 100,000 patients on file. The system can maintain records of 1.5 million patients.

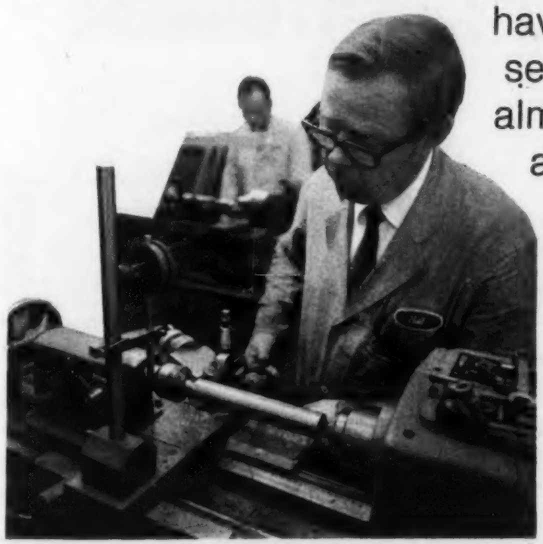
ComputerComm currently maintains its central computer in Birmingham, with a branch office in Cleveland, Ohio. The company is negotiating with several groups to link its operations to the center in Birmingham.

WHY WE STOCK PARTS FOR A VANISHING BUSINESS.

The unit record business is in such a state that it produces only about $500,000,000 in annual revenues in this country. Maybe only $600,000,000.

If that seems like a lot of money for a vanishing business, consider the fact that there are an estimated 600,000 punched card machines now in use at more than 40,000 installations.

A lot of equipment for a vanishing business. And it takes a lot to maintain our share of it. That's why we stock 16,000 parts, why we reconditioned over 3,000 machines during the past fiscal year, and that's why we have a customer service force of almost 1,000 men and more than 50 service offices.



Sometimes we wonder what it would be like in a business that wasn't vanishing. But after all this time we're used to it. People started waving handkerchiefs at the unit record business fifteen years ago when IBM brought out the 650. Then it was the 705. Now it's System/3 and we're getting the senior citizen treatment again.

Not that the unit record business hasn't changed. But changed is not gone. Punched card consumption keeps going up every year. Walk into just about any office and you'll find some familiar tabs and sorters and verifiers still churning away. Still doing the same jobs. Or doing new jobs, such as low-cost computer editing and back-up. Much as the IBM 1401 (remember when that vanished?) is now being used in support of more sophisticated computers.

And if you think the only people left in the unit record business are the brokers, you are invited to contact one of our sales representatives. He will assess your data processing needs and recommend the right machines for you. You can buy them outright, or you can rent them short or long term. Or both. However you choose to do it, you will probably end up saving money.

The new computers, those high-priced stars, are getting a very noisy reception. Which is as it should be.

But if you listen closely, beneath all the commotion you can hear the familiar sound of the punched card machines. Humming away, getting the work out. And, of course, needing attention. That's why we stock all those parts. They're very important in a vanishing business.

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Docuteller Money Dispenser Automates Bank Teller Function With 7-Day Week

By Peter F. Carr
CW Staff Writer

The Docuteller Currency Dispenser will enable banks to dispense cash on a 24-hour-a-day, seven-day-a-week basis.

DALLAS – A cash-dispensing machine that accepts credit cards from customers and will eventually lead to unmanned teller stations will soon be installed in about 20 banks throughout the U.S.

Recognition Equipment Inc., which manufactures the Docuteller Currency Dispenser, said the machine is designed to be linked up to a computer as a first step in automating the function of the bank teller.

The money dispenser will provide customers with a 24 hour-a-day, seven-day-a-week banking service.

A magnetically encoded standard size plastic card will be issued to each customer to activate the currency dispenser. This will be used in conjunction with each customer's personal identification number.

A magnetic strip on the card contains up to 80 characters of information for customer identification.

The customer operates the machine by inserting the card The machine then requests the customer's personal identification number. He answers by pressing the correct keys on the keyboard, and this number is verified with the information on his card's magnetic strip.

If the customer accidentally pushes the wrong keys, he is automatically instructed to try again. A total of three incorrect attempts will cause the machine to keep his card for bank verification. This feature is a safeguard against lost or stolen cards.

Following verifications, the customer is instructed to select one of two fixed amounts which are prepackaged in the dispenser.

Before dispensing the currency, a debit voucher is automatically printed. It is delivered, along with the cash, to a cash drawer receptacle.

This whole transaction takes less than 15 seconds.

A copy of the debit voucher is retained by the dispenser for the bank's use. It is printed in a special type font for computer processing.

Each bank determines in advance the maximum amount of each withdrawal and the number of times a cardholder can obtain cash both on a daily basis and within any other specified time-period. This information is encoded and updated on the magnetic strip.

If a cardholder exceeds the allowed number of withdrawals in a day, the dispenser returns his card but dispenses no cash. When he reaches the limit of his allowed uses in a specific period, the card is retained in the dispenser for further evaluation by the bank. The expiration date is also verified. If the card has expired, it is retained in the dispenser.

In all three cases, an illuminated message on the dispenser display screen notifies the cardholder why he has not received his card, his currency, or both.

The advent of the automatic teller stations offers two important advances. First, it will relieve the banking industry of its personnel shortage. Secondly, it will offer the customer the convenience of around-the-clock banking.

The company is currently developing a system for deposits and payments and other associated bank functions.

Chattanooga Garbagemen Finally Succeed: Computer Brings A Balanced Workload

CHATTANOOGA, Tenn. – A new computer-assisted plan for garbage collection service is being used by the Public Works Department of the City of Chattanooga.

James Templeton, superintendent of city yards, said results of 33 new garbage pickup routes announced recently show that workmen have balanced workloads, "an accomplishment we have been striving over a long period of time to achieve."

Templeton said that the routes were selected with the aid of an IBM 360/30.

City Engineer Ellis Spencer said that improved efficiency of the sanitation workforce has overcome problems brought on by rapid urban growth and an increase in volume of individual household wastes in recent years.

The 33 new routes are designed to accommodate the present sanitation workforce of 56 employees on 17 day routes and nine employees on two night routes. The crews serve Chattanooga's 34,000 residences twice weekly. Only minor changes were made in night schedules for business areas.

By evaluating many variables involved in scheduling, the city's computer calculated each day route to be almost the same in pickup time and driving distance. Each crew serves about 1,000 residences daily, collecting and disposing of approximately 5,500 cubic yards of garbage.

Under the old collection schedules, determined only by judgment, there could be considerable difference between lengths of routes. Templeton said this led to problems of inefficiency and morale because trucks and men were constantly being rerouted to complete collections each day. By comparison, each of the new routes will require an equal number of hours to complete.

"We supply computer-printed details and maps of all routes to the crews each day," Templeton said. "Each man knows exactly what his assignment is and he doesn't have to assist other crews. At the same time, city supervisors know exactly what is being done and where."

To accomplish changes, the city last year surveyed collection times, distances, locations and problems connected with routes. Data processing personnel used the details to adapt IBM's Vehicle Scheduling Program, which told the computer what to do.

"Our figures included information on similar type dwellings, recent annexations, building increases, urban renewal projects, freeway construction, population increases and population shifts," Templeton said.

Just Plain Plane Maintenance

'311 Fingers' Monitor Flight Performance

KANSAS CITY, Mo. – The pulse and heartbeat of Trans World Airlines' giant Boeing 747s will be monitored continuously by an on-board computerized recorder. This system will allow TWA's mechanics and engineers to get a closer look at the flight performance of this new aircraft; as close as if they were riding along on the flight.

The new monitoring system is like 311 fingers on the pulse of the world's largest commercial aircraft soon to be delivered to TWA.

In announcing the recent purchase of "Aircraft Integrated Data System" equipment, known as Aids, TWA said that the 747s should be among the most extensively monitored airplanes ever flown. The monitoring equipment, which cost $1-1/2 million, was purchased from Teledyne Systems Co., Northridge, Calif.

TWA has been using Aids used aircraft and engine monitoring devices on its DC-9 fleet, but the equipment to be installed on the big 747s will be far more sophisticated.

Present Aids equipment used on TWA's DC-9 is largely employed to monitor the performance of the jetliner's engines. On the 747s the capaicty of the monitoring equipment is used to keep check on the performances of the engines as well as the other systems on the airplane.

Basically, an Aids system is designed to keep a continuous record of the performance of all the systems of an aircraft and its engines, plus environmental conditions, while the plane is operating. Later, this record is studied by engineers to increase the efficiency of the aircraft.

Teledyne's system on TWA's new 747s utilizes 311 electrical sensing devices throughout the aircraft, and other electronic packages and magnetic recorders. These sensing devices measure parameters for analysis such as: engine temperatures, hydraulic and oil pressures, fuel quantities, air speed, altitude, rudder position, cabin temperatures, and flap retraction times.

Comprehensive Picture

After each flight, with the help of computer equipment on the ground, these parameters can give engineers a comprehensive picture of a particular plane's day-by-day performance throughout the year.

Typically, Aids recording devices will monitor aircraft and engines at regular intervals during engine start, take-off, climb, cruise, descent and approach segments of each flight. Such trending information will be recorded for varying periods of time, on an incremental magnetic tape recorder where it will be permanently stored.

Normally, on a lay-over in the evening, a cassette magnetic tape storage unit within the incremental recorder will be removed from the aircraft and a new one put in its place.

Mechanics then will place the cassette in a remote data terminal, which might be anywhere in the worldwide TWA system. This terminal reads the data on the tape and, through a data transmission device, sends the information via standard commercial telephone or microwave radio relay systems to computers located in Kansas City at TWA's worldwide overhaul base. They will be computer-stored for later analysis by engineers. If a particular plane develops a problem, its trend information can be drawn on immediately for study.

A new IBM 360-50, recently installed at TWA's overhaul base, will be used in connection with the Aids system, although such applications will not be thoroughly operational for some time.

Beyond trending information, the new Aids system also offers one other major benefit for TWA maintenance personnel.

Should a problem develop in flight, the 747's flight engineer can initiate a special circuit within the Aids system that will record a "trouble data output tape" of all the parameters being monitored on a particular system. The tape can be transmitted to Kansas City, quickly interpreted by the computer and relayed back to the originating station where the computer's analysis of the problem will be displayed visually to TWA maintenance men on a television set. Such a report would also be displayed if necessary for TWA engineers at Kansas City. The television portion of this operation is still in the planning stages although it will eventually be implemented.

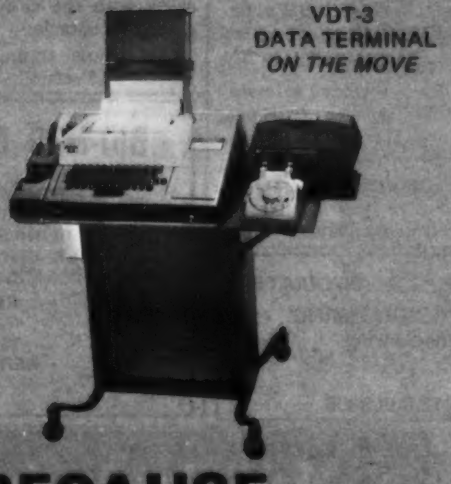
Engineer Has Choice

In selecting the area to be monitored for trouble data, the flight engineer has a choice of hydraulic systems, surface control system, navigation equipment, autopilot flight director systems, and environmental control systems (air conditioning and heating). Or, he can choose the "all systems" position on his Aids control panel. This position covers the entire spectrum of systems within the airplane.

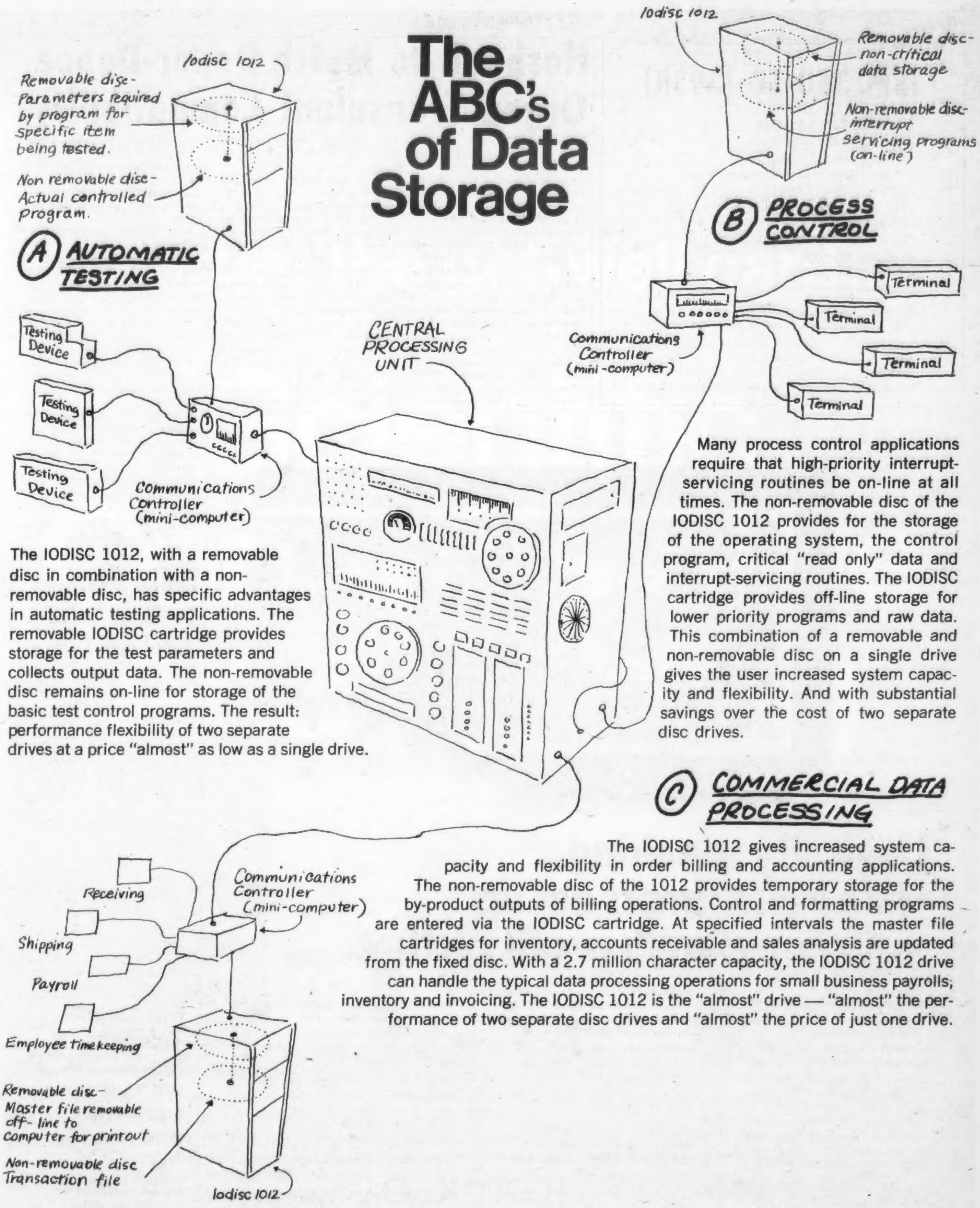
When he selects to initiate a trouble output report, the data on a five-minute continuous loop recorder is transferred to the incremental recorder for permanent storage. This permits analysis of the data preceding, during, and after the malfunction.

The object, of course, is to quickly determine exactly what went wrong, if anything, with the systems on the aircraft during the flight so that maintenance men can correct any malfunctions without the time-consuming delays of a manual inspection of the aircraft's equipment.

The trending information, it is hoped, will not only serve as an aid to increasing the efficiency of the airplane, determining, for example, that particular cruise speeds affect a lower fuel consumption rate, but also as an aid to lengthening service life of various pieces of equipment on board.



The ABC's of Data Storage



(A) AUTOMATIC TESTING

The IODISC 1012, with a removable disc in combination with a non-removable disc, has specific advantages in automatic testing applications. The removable IODISC cartridge provides storage for the test parameters and collects output data. The non-removable disc remains on-line for storage of the basic test control programs. The result: performance flexibility of two separate drives at a price "almost" as low as a single drive.

(B) PROCESS CONTROL

Many process control applications require that high-priority interrupt-servicing routines be on-line at all times. The non-removable disc of the IODISC 1012 provides for the storage of the operating system, the control program, critical "read only" data and interrupt-servicing routines. The IODISC cartridge provides off-line storage for lower priority programs and raw data. This combination of a removable and non-removable disc on a single drive gives the user increased system capacity and flexibility. And with substantial savings over the cost of two separate disc drives.

(C) COMMERCIAL DATA PROCESSING

The IODISC 1012 gives increased system capacity and flexibility in order billing and accounting applications. The non-removable disc of the 1012 provides temporary storage for the by-product outputs of billing operations. Control and formatting programs are entered via the IODISC cartridge. At specified intervals the master file cartridges for inventory, accounts receivable and sales analysis are updated from the fixed disc. With a 2.7 million character capacity, the IODISC 1012 drive can handle the typical data processing operations for small business payrolls, inventory and invoicing. The IODISC 1012 is the "almost" drive — "almost" the performance of two separate disc drives and "almost" the price of just one drive.

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Norbank to Match Donor-Donee Organ Transplant Compatibility

JERSEY CITY, N.J. – A nationwide computer-based network designed to minimize the problems involved in matching organ transplant patients with potential donors is being developed by a software and time-sharing company here.

Thomas Wolff, board chairman of Dynamic Computers/Systems Corp., announced that the company had formed a non-profit corporation, to be known as the National Organ Bank (Norbank), to administer the project.

Matching of donors to recipients presently entails time-consuming manual tissue-typing of the donor, location of the donor, and comparison of cells to determine their compatibility.

In addition, transplants frequently involve long flights across country.

Much work remains to be done in improving donor-donee matches to minimize the chances of rejection, according to the company's medical researchers.

With this factor in mind, Norbank will establish a pilot project on a regional basis. This project will be expanded nationwide upon demonstration of successful operation.

Several hundred receiving hospitals and possibly 20 hospitals performing organ transplants would be included in the system. Terminals with access to a central computer data bank would be installed in these institutions.

To implement the process, the company will develop a computer program to:

- Accept and store profiles of waiting recipients, classified according to kind of organ required.
- Accept and store the profiles of willing donors.
- Provide table look-up of a donor's profile from an identification number input when notified by the physician that the donor is in a terminal condition.
- Match the histocompatibility characteristics of the donor to all awaiting recipients.
- Provide automatic notification of availability of organs and their location to the recipient institutions.
- Update files to remove the profiles of donors or recipients from the system and to enter the profiles of new donors and recipients.

Anyone interested in assisting in the project by contributing time, talent, or resources can contact Norbank at 70 Montgomery St., Jersey City, N.J. 07302. Telephone: 212-285-9428.

Bullet Matching To Help Solve Unsolved Crimes

MIDDLETOWN, N.Y. – A system for solving unsolved crimes by means of matching bullets is being developed by Logos Development Corp., according to company vice-president, Bernard E. Scott.

The company has been working for about four years on the system, in which more than 20,000 bullets associated with unsolved crimes will be file searched and matched on a Digital Equipment Corp. PDP-8 computer, Scott said.

The bullets are presently matched by hand in operations that last for weeks in the case of common types of calibres, he said.

Eventually, he continued, every gun in the U.S. will be able to be matched to the bullets from all the unsolved crimes in the country.

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Subsystem Adds Capabilities to Honeywell OS/200

WELLESLEY HILLS, Mass. – A data base subsystem that is said to enable users of Honeywell's OS/200 to obtain maximum use of their "investment in data" is now available.

The subsystem makes it easy for users of medium-to-large Honeywell Series 200 computers to combine various types of information in a variety of ways, according to Paul T. Jolicoeur, group product manager of medium systems at Honeywell EDP.

The data base subsystem also has built-in security protection that prevents use of the data base by unauthorized personnel. It permits the computer, under program control, to make accurate decisions based on factual data, instead of leaving these decisions to management intuition, he added.

Jolicoeur explained two ways in which the data base subsystem might be used:

With only a checking account number to work with, a bank official could locate a bank customer's name, all other business that customer does with the bank, and what his current asset and credit positions are.

In a manufacturing environment, the data base system could be used by a plant's management to relate a given part number to customers who use the part, to vendors who supply the part, to engineers who are interested in the part, and to machines that must finish the part.

Honeywell's data base subsystem consists of six major elements:

- A file management module that processes various subfiles of the system as a central input/output for concurrent on-line foreground and batched background memory partitions.
- A data description language that allows users to describe all of the components of the data base just once, or as often as required to alter its characteristics. This language also allows users to describe the relationships and associations that are automatically maintained by the file management subsystem, and allows users to assign security classifications to all of the data in the base.
- A namecode generator macro-facility that generates, from a complete name and address, a compact alphanumeric index key of 18 or fewer characters.
- A Cobol data base linkage that allows Cobol programs to access and manipulate the data base through a standard Easycoder interface.
- Assembly level macro-instructions that provide access to the data base, such as read, write, and locate.
- Utility functions for unloading and loading the data base subfiles.

The subsystem is organized into two major units that are physically separate on disk storage devices. The first, a directory of the files, stores all descriptive information about the file's and subfile's characteristics and the location of data within them. The second, the data element, organizes data in a hierarchial fashion into master records, detail records, and data items.

The OS/200 data base subsystem will be available in the third quarter of this year at no cost to Honeywell computer customers who have a Model 1200 or larger central processor with the required features and peripheral equipment.

Inexpensive Flow-Charting Package Accepts Popular Business Languages

LOS ANGELES – A software package said to be faster and less expensive for automatic flowcharting and documentation that accepts many of the popular business-oriented languages is available from Computer Time and Software Sales, Inc.

A modular system, Logigram accepts input in Cobol, RPG, ALC/BAL, and Autocoder. CTSS said that the system can be improved and updated to meet changes in computer industry standards.

Said to be exceedingly simple to use and extremely fast, Logigram can produce source listings, cross-reference listings, detailed flow charts, debugging keys, and other documentation by products in from one to three minutes of computer time, the firm said.

CTSS said that Logigram will operate on any IBM 360 with at least 32K of storage. It can be modified to work with other computers, such as the RCA Spectra 70, and the Univac 9000 Series, according to CTSS.

The system can be operated under DOS, OS, or its own supervisor. The use of DOS or OS would permit the package to be used in a multi-program environment.

Logigram is said to have several advantages over other documentation systems. It is said to accept more of the popular business languages than any other system. In addition, a new language can be added more easily, due to the modular architecture of the package.

Lower set-up and run times are claimed for Logigram. The company said that in a recent test it found that Logigram had documented three Cobol programs while a competitive system was still running the first program.

Simplicity of operation is said to be such that an operator can perform the run without the presence of the programmer or systems analyst. This allows the job to be scheduled at off-peak hours.

The packages does not "overgenerate" paper, according to CTSS. The amount of documentation produced is said to be only 25% of that required in other competitive systems.

The advantages of automatic documentation systems over the manual method are manifold. The elimination of a tedious, clerical job is favored by most programmers, and the management is definitely in favor of the accuracy and completeness of the end-product.

Also bypassed are problems directly resulting from a lack of standardization in flow-charting techniques. Eliminated are requirements for a degree of drafting ability on the programming staff, according to the company.

CTSS cites a case study which is said to indicate the savings possible through use of the system.

A program, CTSS said, was written and documented manually, requiring 34-man hours at $6/hr and 6 computer hours at $40/hr, totaling $444.

The same program using Logigram is claimed to have required 29 man-hours and 3.6 computer hours. At the same hourly rates, the total cost was $318, a savings to the user of $126.

Logigram is priced at $8,000 for a four-language disk pack. A pack with the Cobol module costs $3,000. Other combinations of languages are available at comparable prices.

The documentation package is currently available from Computer Time and Software Sales, 11941 Wilshire Blvd.

'Pro-Chect' Translates Numerals Into Alphabet

TALLMAN, N.Y. – Pro-Chect, a software routine which translates numeric amounts to alphabetic translations, has been developed by Scorpio Data Systems Inc. to act as a security guard against numerical tampering of computerized checks.

The user inserts Pro-Chect in any computer program entering the numeric amount to a fixed field, and with software control receives the translated alphabetically expressed monetary amount.

Written in Cobol, Pro-Chect can be used in almost any program where the system supports Cobol.

The routine is fully documented and flow charted; user instructions are provided to inset in any program. The maximum print-line size required is 60 characters. This will handle any amount up to $99,999.99. Larger amounts can be accommodated by special requests.

Installations are handled entirely by mail due to the low purchase price of $225. Custom installations are available on a time and material basis with provisions for the customer to pay travel expenses.

The company address is Box 341 – Route 59.

'Fedtax' Prepares Returns at Low Cost

PRINCETON, N.J. – Federal Income Tax computation program (Fedtax), designed for computer time-sharing use, is being marketed through the Al/Com computer time-sharing network, a service of Applied Logic Corp.

Fedtax is designed to save time and increase the profit potential of accountants who prepare individual income tax returns, the company reported.

To use Fedtax, an accountant employs an interview form to record figures given him by his client. In response to the instructions generated by Fedtax, the data is then entered into the computer via a teletypewriter terminal.

After the basic data on wages, exemptions, and deductions have been recorded, Fedtax immediately performs all computation, cross-referencing, and table look-ups.

A special "counseling" feature compares deductions for interest, taxes, medical expenses, etc. with national averages. The program figures tax by alternate computation methods, and suggests the best method.

When the accountant is fully satisfied with the results, Fedtax prints final figures for the return, including an estimate of next year's tax and Schedule G or R when required.

The charge is the same as Applied Logic's regular time-sharing rates. The price range works out to $2 for simple returns, and about $10 for complex returns.

Applied Logic Corp. is at 1 Palmer Sq.

Correspondence Service Package Produces 255 Different Letters

BERKELEY, Calif. – A computer correspondence system is now available as a proprietary service package from Computer Dynamics Inc.

The system, called Profile/Letter Writer, is capable of merging extracted file data with coded message specifications at top equipment speeds in a single computer pass.

The system employs data files owned or controlled by the user, and can produce person-to-person letters and other documents on or off the client's premises, utilizing high-speed on-line printers or intermediate spooling devices.

Profile/Letter Writer is designed for IBM 360-35K partitioned configurations.

The package is marketed in three ways. In-house users are charged $5,000 for the program, installation and training, user's manual and warranty.

Royalty arrangements can be worked out with service organizations. Full documentation, installation, marketng support, and materials and production standards are included

The package is also provided as a service with price dependent upon size of a letter and specific job requirements.

The company is at 1760 Solano Ave.

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Tele-Cobol Adds DOS/360 Version

NEW YORK – Complex Systems Inc. is offering a DOS/360 version of Tele-Cobol, a proprietary system allowing DOS users to receive and transmit data to remote terminals using Cobol or other high-level languages.

The system runs on DOS/360 release 21; uses approximately 10K for the communications task; requires a 2701, 2702, or 2703 transmission control unit; and sells for $15,000. The price includes installation and a three-month maintenance program.

Deliveries are made within two months, the firm says. Complex Systems Inc. is located at 122 East 42nd St.

DMS Has DP Usage and Loan Packages

NEW YORK – An installment loan accounting package and a package to analyze computer equipment usage and efficiency have been produced by Data Management Services, Inc.

The modular system, called Computer Utilization Accounting System (CUAS), analyzes the resources of data processing operating departments so that management may make objective decisions regarding equipment use, peak work-loads, personnel effectiveness, and application usage.

CUAS anaysis of categories includes production, test, maintenance, operator error, and machine error. Results are offered by application, job, machine, shift, time of day, and run code.

Written in Cobol under DOS, CUAS is designed to run on a 65K IBM 360/30 or its equivalent. The system can run in a 'stand alone' or multiprogramming environment. It requires the use of one disk drive and four tape drives.

The program package may be licensed for five years at $2,500. Two man-days of installation assistance are offered, which include compilation of the client's equipment and training.

Complete documentation consists of system description, system flow chart, program description, program flow chart, input/output definition, source deck and listings, operations guides, and user operating procedures.

CUAS is available for immediate delivery.

An installment loan accounting package for banks reportedly will streamline installment loan service, reduce operating time, and lower costs, according to the company.

Produced by Data Management's Implementation Division, the software package is written modularly to permit the user to tailor it to his own needs.

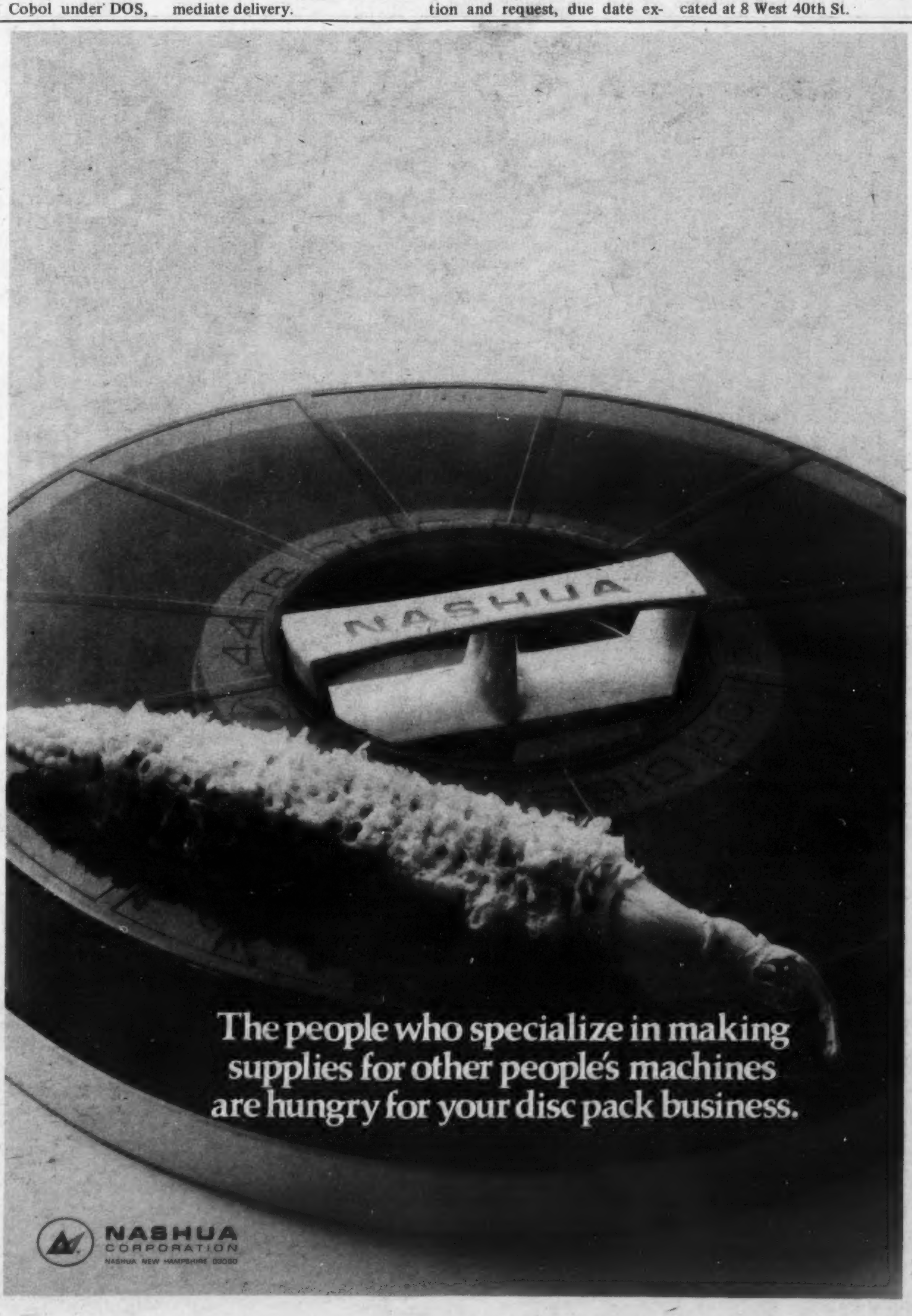
Features of the accounting package include complete organization of data as to the bank, branch, dealer, type of loan, and loan number. The system maintains a complete history of all transactions affecting loan balances and maintains up to six variable payment schedules, the company said.

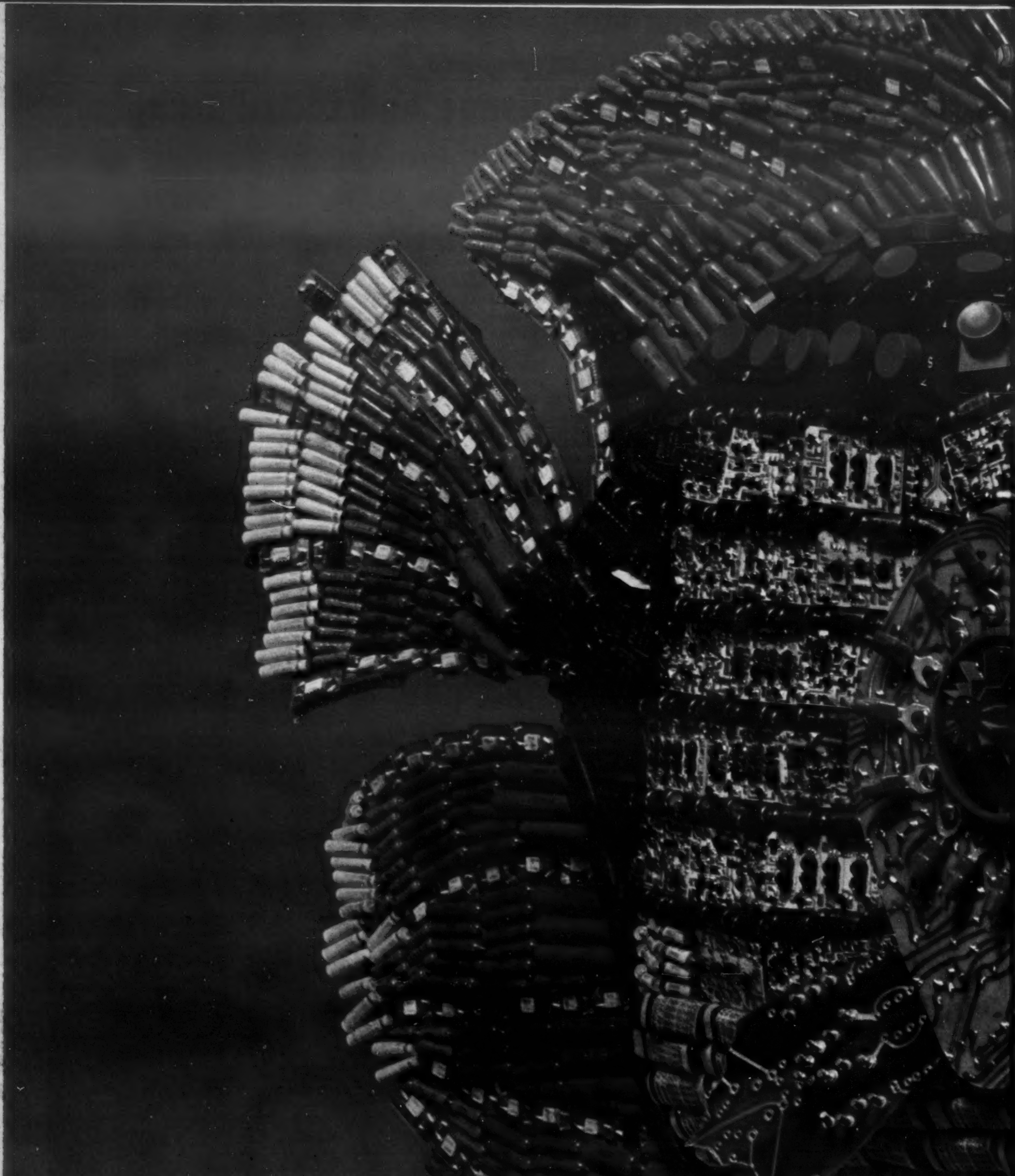
The package includes interrogation and request, due date extension, late charge payment and adjustment, name and address change, automatic charge payment, rebate credit and adjustment, and write-offs and cancellations.

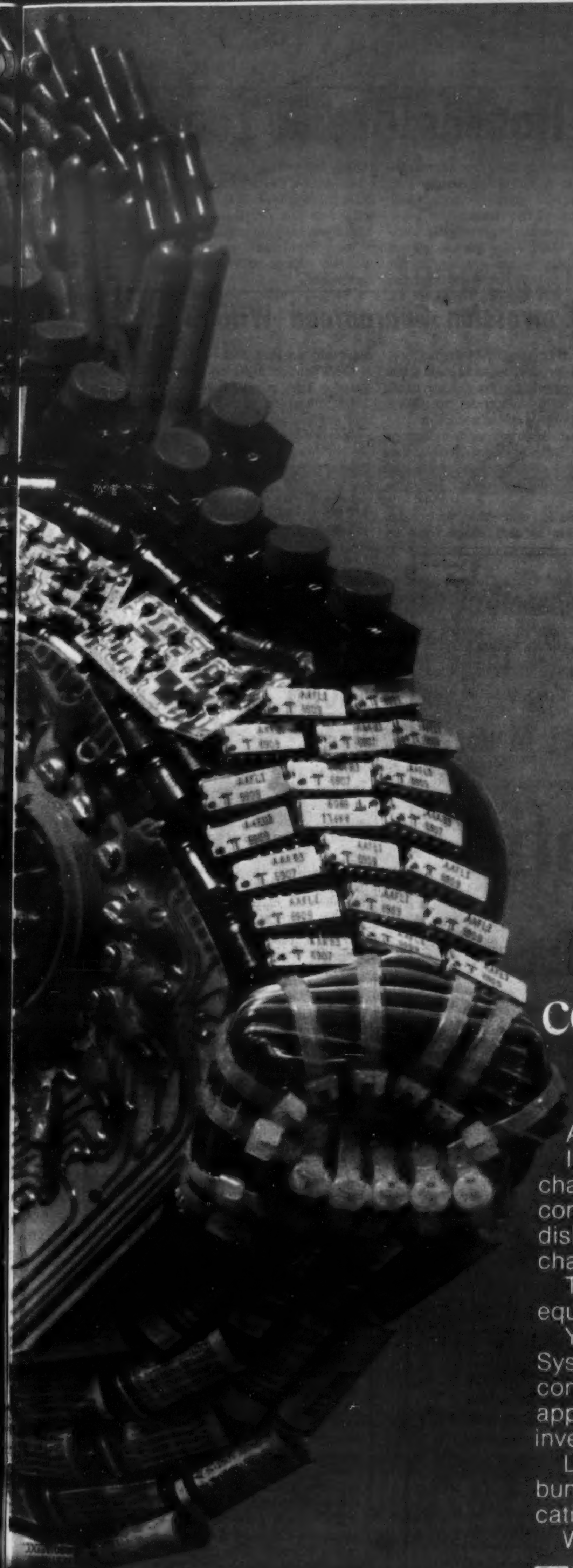
Pay-off payments, coupon book request and creation, loan summary audit confirmation, annual interest, trial balance, account history, delinquency reports and summary, interest, and rebate are also included.

Written in Cobol under DOS and designed to run on a 65K IBM 360/30, the package sells for $15,000 which includes installation, four man-weeks of support, and a six-month warranty.

The package has a delivery schedule of two weeks. Data Management Services, Inc. is located at 8 West 40th St.







IBM Program Helps Brokerage Houses Break Logjam

software/systems

WHITE PLAINS, N.Y. – Clerks in brokerage house "cages" have been promised help in handling "free" certificates through a computer program from IBM.

The program, Active Certificate Information Program, is said to allow brokerage houses to replace manual processing of certificates wtih an on-line visual recording and information system using IBM 2260 display stations linked to a 360.

The program is described as permitting the computer to absorb many of the bookkeeping chores associated with the handling of "free" certificates, which are certificates the firm itself owns or those which it controls, such as stock retained in "street" names for customers with margin accounts.

Clerks in the cashier's department, or "cage," normally record the receipt and delivery of these certificates. They write a security movement ticket by hand, look up the house-assigned security number, and then transmit and verify the information for the back office accounting system. When a securities delivery is ordered, the clerk generally has to search through stacks of certificates to find the required denomination.

Although clerks will still retain physical custody of the certificates, the IBM program will allow them to key familiar codes into a video display terminal which asks the computer about the availability of a security. The clerks can also enter information about the receipt or delivery of a certificate, IBM says.

Both the inventory of active certificates and the file of pending delivery instructions can be posted by the clerks as each transaction is completed. This permits inventory information about newly received certificates to be available immediately for meeting delivery requirements.

In addition to speeding the inquiry and delivery cycles, the computer system can eliminate many of the chances for error inherent in a manual process, IBM said. For example, the display station allows the clerk to check his posting before pressing a button that sends the information to the computer.

The Active Certificate Information Program runs under DOS and can be used with 360/30s or larger, having at least 64K bytes of core storage. It is scheduled to be available in December, 1970, at a monthly charge of $300, under a license agreement.

100% Conversion Guaranteed With 'Tacos'

DALLAS – Management Systems Corp. has expanded its services to include guaranteed 100% conversion by the use of its Tacos IBM 7070 Autocoder to Cobol translator, according to the company.

The Tacos package allows installations to convert to Cobol with potential savings of from 50% to 300% over the cost of recoding Autocoder statements, the company said.

Tacos requires that the Autocoder source program in card image form be read into an IBM 360. A Cobol program is then produced which is compiled and tested. The required equipment is a 256K, blank memory 360/40, the firm said.

Management Systems will provide any installation with sample translations on request for $360 or 18 cents per Autocoder source card. The program can be purchased for $18,000 or leased for $12,000 a year. Both prices include installation, on-site training, and documentation.

The charge for Tacos as a service is based on a sliding scale depending on the complexity of the original 7070 programming.

The company, at 7007 Preston Road, says it can deliver the program within 10 days.

$5000 A/P Package Uses Cobol for 360

WELLESLEY HILLS, Mass. – First in the line of Keane Associates, Inc.'s programming aids is a $5,000 accounts-payable package.

The new package is written in Cobol for use on IBM 360 configurations having memory capacities of 32K bytes or larger, with either disk, or tape/disk external storage devices.

Major features of the payables package include extensive editing of all input data, manual or automatic due-date calculation, prepayment audit ability, automatic check writing and reconciliation, and multilevel expense analysis.

In addition, a payables-activity report feature produces detailed listings of new payable items, amounts paid, and trial balances in one concise listing.

The $5,000 purchase price for the package includes all programs and documentation. Installation of the package and special customizing efforts are additional, the company said. The package is available for immediate delivery.

Keane Associates, Inc. is at 36 Washington St.

'Batch' T/S Service Improves PDP-10 Use

ANN ARBOR, Mich. – The Cyphernetics Corp. has released a time-sharing service that will give users the full resources of their PDP-10 equipment at substantially lower cost than previously possible, the company said.

The new service, called Batch, enables users to run their programs after regular business hours, thereby availing themselves of lower service rates.

A "command file" feature makes it possible for users to run programs without an operator.

The prime rate for connect-time between 9 a.m. and 5 p.m. is $10/hr; off hours connect-time, 5 p.m. to 9 a.m., costs $6/hr. Charges for CPU time vary according to the size of the program. The Batch program cost would vary from one cent/CPU sec, minimum, to fifteen cents/CPU sec for a 40K-word program. Monthly storage charges are $1 per thousand characters.

The Cyphernetics Corp. is at 2290 First National Bldg.

COMPUTERWORLD

1970 Time-Sharing Supplement

March 25, 1970 Supplement/1

A Look at In-House Time-Sharing

Consulting experts explain the steps users must take to determine the value of in-house time-sharing . . . . Page S/4

A Comparison of Time-Sharing Offerings

Computerworld compiles a partial listing, about 130, of time-sharing companies. The prices, languages, services, and locations are compared in a three-page chart . . . . Pages S/6-8

The Future of Time-Sharing Technology

What users can expect of time-sharing in the next five years. What are the barriers to be circumvented to make these things happen? . . . . Page S/12

The Financial Viewpoint on Time-Sharing

Time-sharing has cost millions to get it working. Some observers comment about how fast the investment can be recovered, and the kind of return that can be anticipated . . . . Page S/15

What Does Unreliability Cost Users?

What is the price of unreliability? How users can protect themselves from problems. The effects of unreliability on the time-sharing industry . . . . Page S/18

Do Users Still Need Immediate Response?

Trends' change. New applications require new ideas and have different demands. Time-sharing too changes. The kinds of changes and what they imply are discussed . . . . Page S/18

How Did Time-Sharing Happen?

The factors that brought time-sharing into existence. The needs it serves and the ways it might be used . . . . Page S/19

A limited number of additional copies of this supplement are available at 20 cents each. CW pays postage on prepaid orders. Send requests to: Circulation Manager, Computerworld, 797 Washington St., Newton, Mass. 02160.

New Aid to Education

Time-Sharing Offers a New Tool for General Teaching

By Peter Carr
CW Staff Writer

The nation's schools are rapidly becoming aware of the value of time-sharing in education.

For both students and teachers time-sharing offers a new approach to learning by making available an advanced method of problem solving.

Time-sharing has become an essential part of academic life, particularly in the New England area where the innovative influence of Dartmouth College has had a marked effect on computer aided education techniques.

Began in 1964

As an educational concept, time-sharing did not receive any wide usage until 1964 when Dartmouth acquired a GE-265 with the help of General Electric and the National Science Foundation. By the fall of 1964, the Dartmouth team, led by Professor John Kemeny and Professor Thomas Kurtz, had increased the number of terminals to 20.

Dartmouth students were invited to use the system and instruction in the use of the computer became a part of the mathematics curriculum.

The students quickly learned the usefulness of the computer in courses having a quantitative aspect. Although the new system offered a number of different types of services, it was somewhat limited in the size of computing jobs that could be handled. However, the example encouraged the faculty to explore further the ways of enhancing teaching methods through the computer.

Third Major System

Dartmouth is presently operating with its second major complex of computer hardware and its third major operating system, called the Dartmouth Time-Sharing System (DTSS).

Built around a GE-635 computer, the system consists of a number of different pieces of interconnected hardware and a complex Dartmouth-written software system.

The central processor is equipped with 98K words of core storage, and is capable of performing over 300,000 additions per second.

The telecommunications equipment includes two Datanet-30 computers. These are connected through telephone company datasets to the internal college telephone system. In addition, Datanet-30s are connected to other Datanet-30s located in distant cities.

The Datanet-30 has 16K words of 18-bit storage, with an access time of about 6 μsec. Each computer can handle about 100 teletypewriters.

Software System

The software, like the hardware, acts as an integrated unit. Its major function is to act as a supervisor or administrator of the computer's work.

It schedules the jobs requested by up to 200 users, controls the flow of information in and out of the system, and manages the use of mass storage for the programs and data-files for the users.

The supervisory portion of the software resides in core storage, and requires between 30K and 40K words.

Besides the supervisory function certain other parts of the software deal with the editing of programs and the translation of a language such as Basic into a machine language.

Terminal Users

At present there are over 110 terminals in use within the Dartmouth community. About 26 are in use in other institutions of higher education, and over 35 in secondary schools.

The computer is used in the Dartmouth Medical School, the Thayer School of Engineering, the Tuck School of Business Administration, and in many of the departments in the Faculty of Arts and Sciences.

Most students at Dartmouth receive their initial indoctrination in computer programming and time-sharing in the college's basic mathematics courses. In these courses, students are given two one-hour evening lectures. This is the extent of their formal instruction.

In each of these courses, students are required to write computer programs for four problems related to the particular course.

Some students do not take the course until their second year in college, while others find that they are expected to do an economics problem which involves great masses of data, and have to suddenly learn programming on their own, or from a friend.

Uses of the computer range from data analysis to laboratory reports, from making prediction models to statistical analyses, from playing business games to investigating sentence structure in Virgil, from simulation processes to teaching non-college-bound high school students computer programming. As one professor reported, "Many of the students use the machine for daily course preparation in ways not anticipated nor expected by the professor."

High School Use

About 25 high schools in the New England area are involved with the college's Computation Center. The main purpose of this association is to show that the computer can be a significant contribution to secondary education within the existing curriculum, without extensive teacher training.

The system demonstrates that computing encourages students to think creatively. Materials published as a result of this research serve as guidelines to others in the utilization of computers in education.

In its role as a regional computer center, Dartmouth pro-

(Continued on Page S/18)

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NATIONAL CSS, INC., 9 E. 41st ST., NEW YORK, N.Y. 10017, (212) 986-9560 and offices in LOS ANGELES, SAN FRANCISCO, CINCINNATI & BOSTON.

A Consultant's Viewpoint

Users Should Anticipate In-House Time-Sharing

**By Sherbie G. Gangwere Jr.
and James S. Peachey**
Special to Computerworld

If a corporation is spending more than $10,000 per month on outside time-sharing services, it is probable that management has given or is giving thought to buying an in-house time-sharing system to replace the outside vendors. Most data processing managers shudder at the thought.

The very fact an organization is using several time-sharing vendors makes the conversion to an in-house system difficult. Every vendor's Basic is different. Nevertheless, all of these programs must be made to run on the Basic of the in-house system.

Because of the conversion problems, it is good practice to use only one time-sharing vendor when using outside services.

Other Problems

When the time comes for conversion to an in-house system, there are still other problems that must be faced.

For example, some programs won't fit on the in-house machine, the Fortran and Basic compilers may not have the capability of the time-sharing vendor's, and the file system may be different. The user is faced with a major conversion project.

Despite these obstacles, it is possible to develop a plan of attack that will result in an orderly conversion.

From experience with numerous commercial time-sharing systems, we know that most programs are rather modest. They are small in size, need little computer time, and use only the elementary functions that are available in a compiler. These programs can be moved in-house easily.

There is a high probability that some small percentage of programs will have to remain on a time-sharing vendor's system. If they do not, they will require a major rewrite.

The first task is to develop an evaluation form based on company requirements that will compare the present time-sharing service with the proposed system. Such items as compute load, program size, language, file system, back-up and recovery, accounting, extendability, and reliability should be included on the form. In addition, those considerations that are peculiar to each company should also be included.

Compute Load

One of the first areas that should be considered is the actual compute load. This can be determined by using a method that measures the proposed system compared to the current time-sharing services.

The user selects a set of jobs that range from large to small. By running these on the current system, he can measure the amount of CPU time used as well as the elapsed time. He can then run the same programs on the proposed system and measure the CPU time and elapsed time.

Now a user can establish an average ratio of the computing power of the two systems. While admittedly crude, this method does the job. Tools to handle the task more effectively generally are not available.

This article discusses several major points users must consider when considering converting to an in-house time-sharing system. The idea is for a user to build a 'form' that describes his criteria, and then evaluate his current outside service against a proposed in-house system.

Principal points on the 'form' are:

- **Computation workload**
- **Compatible program sizes**
- **Compatible languages**
- **Flexible data management system**
- **Recovery procedures**
- **Accounting routines**
- **System extendability**
- **System Reliability**

The user should remember that while he is measuring on the time-sharing service machine, other users will load the system. Therefore, when you are measuring on the proposed system, you should use as many terminals as possible to load the system. This will provide a much more accurate face-to-face evaluation of the two systems.

Evaluation Form

On your evaluation form you should also include such basic entries as:

- Number of times per week the program is run,
- Amount of CPU time on the vendor's system per run,
- Amount of CPU time on the proposed system,
- Total running time on the proposed system.

All of the programs selected must be run on one of the systems. The scaling factors can be used to extrapolate to the other system. With data on all programs, simple arithmetic determines the answer to the first question . . . will the proposed system handle the work load?

Program Size

While most programs are modest, program size has a great effect on a time-sharing system. It influences the system's throughput by being inversely proportional to multiprogramming capability.

This means that as a program increases in size to the point that it is the only program in the work area, the system approaches a uniprogramming environment.

Statistics gathered from commercial time-sharing systems show that 90% of all Basic and Fortran programs are 300 statements or less. Because of the decreased size of the user's work area associated with a smaller in-house time-sharing system, it is obvious that the maximum program size will be less than the maximum size of a large commercial system.

At this point, the user has to consider if he can execute present programs on the prospective in-house system.

He can answer this in two ways: first, the programs at hand will fit in the allocated work area; second, the programs must be segmented into smaller pieces. In other words, he is faced with a complex problem of trade-offs as to whether he should keep existing programs intact or segment them. There is no easy solution.

In deciding on program size, the user doesn't always know whether his present programs will fit on the proposed in-house system. A systems manual of a prospective vendor will give only a "ball-park" figure on the number of source statements or characters the system will accept because of its resource scheduling algorithm.

However, a resource scheduling algorithm doesn't always take into account the number of files opened or the block size needed in the work area for the files. If a user has doubts as to how your present programs will fit on the proposed in-house system, he can lay them out in meaningful segments and obtain test time from a nearby facility, or go to a manufacturer for test time. The latter is probably the best solution.

Now, the user can evaluate each program. One major question should be: "Will Program Fit on System?" If not, the user needs an entry to estimate the time needed to segment the program.

Language Considerations

As time-sharing has become more sophisticated, services have increased in magnitude as have the multiple types of languages. Today languages available to the user partially include: Basic, Extended Basic, Super Basic, Fortran II, Fortran IV, Fortran V (down the line), Algol, Cobol, Trac, Lisp, APL, and PL/1.

Basic and Fortran IV with their associated subroutines fit most of today's scientific users' requirements. This group of users doesn't need Cobol-type languages. However, they may need a simple or unsophisticated text-editor or string-manipulator such as a subset of Trac or Snobol.

The user who wants easy access to a very large data base has a much different set of needs.

His wants vary from a complicated security process to quick access to his data base via mass storage. Fortran certainly doesn't facilitate easy manipulation of a data base, nor does it allow for much security. Therefore, this user needs an elaborate command language as well as swift data access.

Debugging batch type programs, without a more or less compatible conversational language, is next to impossible. Here is a group of users with a completely different set of requirements.

The list of requirements is endless. However, we have established the point . . . time-sharing systems are similar, but user language requirements vary from one extreme to another.

The user must identify the statement types and subroutines available on the present time-sharing service that aren't available on the proposed system. In addition, he has to determine the estimated conversion effort needed to replace functions that aren't available.

File System

No in-house system should ever be considered that doesn't have data file capability. Most time-sharing data file systems use some form of sequential access.

The user must determine whether or not the programs using data files will run unchanged on the proposed in-house system. If they won't, then obviously all file handling programs will require modification. If they must be modified, the user has to determine how much work the modification will entail.

The total data file space needed by the existing programs must be considered and a reasonable growth over the next one or two years must be projected using these parameters:

- Does proposed system have enough file space to handle current needs?
- Does it have the capacity to accommodate the projected needs?
- Does it have the capability to add more mass storage?
- Can the software handle the added storage?

These questions must be answered. This part of the study is very critical since the data file structure and storage capacity is weak in most small systems. It requires a careful study to do an adequate job in determining if the proposed system will meet your needs.

Entries must be provided on the evaluation form for the file space required by the program as well as the estimated conversion time needed to adopt the programs to run on the proposed system.

What we are concerned with is the provision made for recovering after data files and programs have been lost due to a hardware failure or software bug.

The system must have some means for dumping the files to a media stored off-line and then provide the means for reading the files back into the system. The two most popular methods are to use magnetic tape or removable disks.

Two pitfalls that the user should look out for are:

- How much time per day does the back-up and recovery require? Many times, this is more than you would think.
- How do you know the back-up copy is good? It is embarrassing to find out that the back-up copy is no good when you need it.

Accounting

In most organizations, internal billing will be required.

Therefore, the proposed system should gather the billing information as well as have a billing program to convert the information into a meaningful format. The minimum information you need should be CPU time used, disk storage, and connect time.

Extendability of the System

As a corporation's time-sharing requirements expand, it has to know if hardware can be added to the propsed system. In addition, the user must know the upper limit of disk storage.

Other obvious questions to be considered in an evaluation are: Can other incoming lines be added easily? Can more core memory be added? Can the software accommodate the added hardware without a rewrite?

The most subtle area is software. One of the most important software considerations is in the area of additional languages and/or application programs. The user should know whether or not the design of the software is such that new languages can be added as the system matures.

In some small systems, the language is an integral part of the structure to such an extent that additional languages can't be added without rewriting all of the software. Obviously, this is a major drawback with the proposed in-house system.

Reliability

While the system may have all the functions required, if both the hardware and software aren't reliable the system shouldn't be considered.

The best source of information in this area is to talk to people who have the system . . . and talk to as many as possible. The next step is to ask the manufacturer for his failure report records.

However, if the system doesn't have a long operational history, as many new systems do not, a user can still evaluate its reliability. To do this, evaluate the manufacturer's personnel on previous systems. This gives a good guide on the probable reliability on the proposed in-house system.

Other Considerations

Several other areas should also be investigated very carefully. For example, the break key on the Teletype is generally used to signal abort on the system. However, some systems can't handle all cases of abort.

Another problem for source systems is the hang-up problem. One user hangs up his data set, another dials in and is connected to the source line. If the system didn't detect the hang-up, it thinks the first user is still on.

Finally, what terminals can the system accommodate? Make certain the system can accommodate the terminals planned for now as well as in the future.

S.G. Gangwere is a vice-president of Reactive Computer Systems, a firm becoming involved with in-house time-sharing systems.

J.S. Peachey is a systems consultant for RCS, and has been through many such conversions in the past two years.

New shortcut—
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A new CSS-created system capability, COBOL Symbolic Debug, drastically *streamlines* the whole procedure of generating COBOL programs.

It establishes simple direct communication between the COBOL programmer and his computer.

It obsoletes "stop-and-go" problem-solving . . . enabling the programmer to work with sustained intellectual continuity.

It produces more results, in less time, at less cost.

Seated at his remote time-sharing terminal, the COBOL programmer can establish immediate communication with our nearest 360/67 computer. No matter how immense his data-base . . . how complicated his program . . . he now can:

1. **Access his stored program.**
2. **Edit his program instructions directly through his terminal into the computer . . . no keypunch/key-verify card changes.**
3. **Compile his program from the terminal and receive at his terminal appropriate diagnostics.**
4. **Test-run his program whenever he is ready . . . and as often as he needs to. No need to wait.**
5. **Receive immediate information . . . within seconds . . . pin-pointing symbolically the exact location where the first machine-detectable error occurs.**

   This information is far more precise than the usual information presently provided by "core-dumps", etc. Furthermore, it is communicated to him in English, not in machine language.

   Result . . . the programmer concentrates his time and energy in correcting his error . . . not in locating it.
6. **As soon as the programmer has identified the correction he wishes to make, he can communicate that correction directly to our computer . . . speaking to it in COBOL, not machine language.**

   In most cases of data failure, the programmer can actually correct the problem . . . in the remaining instances, he can simulate a correction. In either case . . .
7. **The programmer can then direct the computer to "restart" the program at any desired point (no need to start at the very beginning) and start it running again.**

   At once, the program resumes running . . . and if the first modification solved the problem satisfactorily, the program will run to completion . . . or until the next error is detected.

Working in this fashion, it is not at all uncommon for a programmer to be able to detect and correct not just one, but five . . . even ten errors in one single run!

If he had been working with his in-house computer . . . dependent upon periodic delivery of his core-dump and map . . .

IT WOULD HAVE TAKEN FIVE, EVEN TEN RUNS TO ACHIEVE THE SAME FORWARD PROGRESS.

At CSS:

Compatibility between our 360/67 and other System 360 computers is now an accomplished fact. This means:

a. You can write and test a program on our computer, and it will execute on yours.
b. Once your program is running on your computer, you can continue to develop and improve it on ours, without interfering with production runs.

No wonder result-oriented management, eager to enjoy the efficiency benefits and economies of new COBOL programs, is greeting this new shortcut to results!

Programmers, too, are euphoric. Creative momentum is generated and sustained . . . the satisfaction of accomplishment replaces the frustrations inherent in present "stop-and-go" work methods.

Let our marketing representatives show you how CSS time-sharing can help you produce COBOL programs in the shortest possible time, at the lowest possible cost.

COMPUTER SOFTWARE SYSTEMS, INC.

460 SUMMER STREET, STAMFORD, CONNECTICUT 06901 (203) 327-9100

WHOLLY-OWNED SUBSIDIARIES: PACIFIC CSS, INC., 430 SOUTH PASTORIA AVENUE, SUNNYVALE, CALIFORNIA 94086, (408) 739-6271:
NATIONAL CSS, INC., 9 E. 41st ST., NEW YORK, N.Y. 10017, (212) 986-9560 and offices in LOS ANGELES, SAN FRANCISCO, CINCINNATI & BOSTON.

General-Purpose Time-Sharing Survey

SERVICES COMPANIES	Connect Time (per hour)	CPU Time (per second)	Mass Storage (per 1K characters)	Initiation Charge	Remote Batch Connect Time (per hour)	Remote Batch CPU Usage (per second)	T/S Minimum (per month)	R/B Minimum (per month)	Fortran II	Fortran IV	Fortran V	Fortran ?	Basic	Cobol	Algol	PL/1	Assembler	Snobol	Aid	Lisp	Cal	De-bug	Cogo	Numerical Control	APL	Text Editor
ACADEMY OF COMPUTER TECHNOLOGY, INC. Dallas, Texas	10.00	.10	.75		NC	.05				●			●	●			●	●	●	●		●	●			●
ACADEMY COMPUTING CORP. Oklahoma City, Oklahoma	10.00	.09	1.00	50.00			50.00			●			●		●											
ACCESS SYSTEMS, INC. Paramus, New Jersey	10.00	.28	.04		5.00	.19					●		●	●	●		●	●		●		●				●
AL/COM Princeton, New Jersey	10.00	.10	.75		NC	.05																				
ALLEN-BABCOCK COMPUTING, INC. Los Angeles, California	NC	.12	.12		NC	.05				●				●	●	●										
AMERICAN COMPUTER SERVICE CORP. Cincinnati, Ohio	12.00	.50	NA																					●		
APL COMPUTING SERVICES Van Nuys, California	11.00	NC	.24	100.	NC	.05				●				●		●									●	
APL – MANHATTAN New York, New York	12.00	.08	.14																						●	
APPLIED COMPUTER TIME-SHARE, INC. Detroit, Michigan	10.00	.15	1.00		NA	NA			●	●			●	●	●	●	●							●	●	
APPLIED LOGIC CORP. Princeton, New Jersey	10.00	.10	.75							●			●	●			●	●	●	●						
AXICOM SYSTEMS, INC. Paramus, New Jersey	10.00	.28	.04			.28			●	●	●		●	●	●		●									●
BASIC COMPUTING ARTS, INC. Mountain View, California	10.00	.10	.75							●			●	●			●	●	●	●		●	●			●
BASIC TIME-SHARING Mountain View, California	5.00	NC	1.00										●													
BEVERLY BANK Chicago, Illinois	9.00	.03	NA	100.								●	●		●							●				●
BOLT BERANEK & NEWMAN INC. Cambridge, Massachusetts	12.00	.20	1.00				100.			●			●	●						●		●				●
BOWNE TIME SHARING INC. New York, New York			.16		2.15	.64				●				●		●	●									
BURLINGTON MANAGEMENT SERVICES CO. Greensboro, North Carolina	12.00	.10	.24		NA	NA	100.																			
CALL-A-COMPUTER OF CINCINNATI Minneapolis, Minnesota	9.00	.03	1.50						●				●		●							●				●
CALL-A-COMPUTER OF CALIFORNIA Los Angeles, California	9.00	.03	1.50						●				●		●							●				●
CALL-A-COMPUTER OF CINCINNATI Cincinnati, Ohio	9.00	.03	1.50						●				●		●							●				●
C-E-I-R Washington, D.C.	8.00	.03	.40				100.			●			●		●								●			
CENTRAL COMPUTING, INC. Wichita, Kansas	10.00	.05	1.80									●	●		●											
CHI CORP. Cleveland, Ohio			.10	25.00	NC	.30					●			●	●		●					●	●	●		
CODON COMPUTER UTILITIES, INC. Waltham, Massachusetts	9.00	.08	.40	100.						●			●	●			●			●						●
COMMUNITY COMPUTER CORP. Philadelphia, Pennsylvania	5.00	NC	1.00				50.00						●													
COMPUTER CENTER CORP. Seattle, Washington	8.00	.08	1.00		NA	NA				●			●		●		●		●	●						
COMPUTER COMPLEX, INC. Houston, Texas	30.00	NC	.60						●	●			●				●	●			●	●				
COMPUTER DYNAMICS INC. Boston, Massachusetts	10.00	.10	.75							●			●	●			●	●	●	●		●	●			●
COMPUTER INNOVATIONS Chicago, Illinois	15.00	NA	.80																				●		●	
COMPUTER KNOWLEDGE CORP. San Antonio, Texas	NC	.08	.50							●					●		●									
COMPUTER NETWORK CORP. Washington, D.C.	10.00	.20	1.50		10.00	.10				●			●	●	●											
COMPUTER RESPONSE CORP. Washington, D.C.	10.00	.25	2.00		NA	NA					●		●	●	●		●									
COMPUTER SCIENCE CORP. El Segundo, California	11.00	.50	.30		NA	NA							●													
COMPUTER SHARING, INC. Bala Cynwyd, Pennsylvania	10.00	.04	1.00	100.					●	●			●				●				●	●		●		●
COMPUTER SHARING SERVICES Denver, Colorado	4.00	.05	1.00							●			●													
COMPUTER SOFTWARE SYSTEMS, INC. Stamford, Connecticut	6.00	.38	.13		NA	NA				●			●	●	●		●									●
COMPUTER SOLUTIONS INC. East Orange, New Jersey	10.00	.10	.75		5.50	NC			●				●		●											
COMPUTER TASK GROUP, INC. Buffalo, New York	10.00	.10	.75							●			●	●			●	●	●	●						
COMPUTER TECHNOLOGIES, INC. New Orleans, Louisiana	10.00	.05	NA		NA	NA						●	●	●			●									
COMP/UTILITY, INC. Boston, Massachusetts	9.50	.11	NA							●			●	●			●		●	●		●	●			●
COMPUTIME, INC. Fort Lauderdale, Florida	10.00	.06	1.50	100.						●			●													
COMSERV Philadelphia, Pennsylvania	9.00	.12	1.00	50.00	9.00	.10				●			●	●			●									●

General-Purpose Time-Sharing Survey

SERVICES COMPANIES	Connect Time (per hour)	CPU Time (per second)	Mass Storage (per 1K characters)	Initiation Charge	Remote Batch Connect Time (per hour)	Remote Batch CPU Usage (per second)	T/S Minimum (per month)	R/B Minimum (per month)	Fortran II	Fortran IV	Fortran V	Fortran ?	Basic	Cobol	Algol	PL/1	Assembler	Snobol	Aid	Lisp	Cal	De-bug	Cogo	Numerical Control	APL	Text Editor
COM-SHARE, INC. Ann Arbor, Michigan	14.00	.03	.60		NA	NA			●	●			●				●	●			●	●				●
COMSONIC CORP. New York, New York	650	.03	.90	60.00			10.00		●				●				●				●	●				●
CONLEY CORP. Minneapolis, Minnesota	9.00	.03	1.50	100.						●			●		●											
CONTROL DATA CORP. Minneapolis, Minnesota	NC	.28	.05							●																
CYPHERNETICS CORP. Ann Arbor, Michigan	10.00	.02	1.00	100.	10.00	.01				●			●				●									●
DATALINE SYSTEMS LTD. Ontario, Canada	10.00	.11	.31							●			●				●		●	●		●				●
DATALOGICS, INC. Cleveland, Ohio	9.00	.08	.50	100.						●			●										●			
DATA NETWORK CORP. New York, New York	9.00	.04	.75	100.			100.		●	●			●								●	●				●
DATA PROCESSING FINANCIAL & GENERAL New York, New York	10.00	.15	1.00		NA	NA			●	●			●	●	●	●	●								●	
DAVIS COMPUTER SYSTEMS, INC. New York, New York	10.00	.10	.75		7.50	.60				●			●	●								●				●
DELMARVA COMPUTER INDUSTRIES, INC. Laurel, Maryland	9.00	.03	1.50	100.						●			●		●											
DIAL-DATA, INC. West Newton, Massachusetts	12.00	.05	.65						●	●			●					●		●	●	●				●
DIRECT ACCESS COMPUTING CORP. Southfield, Michigan	11.00	.15	1.00							●			●	●	●											
DIRECTED RESEARCH INC. New York, New York	10.00	.10	.75							●			●	●			●	●	●	●						
EDP CENTRAL, INC. Portland, Oregon	2.00	.07	.12										●		●	●							●			
FIRST NATIONAL BANK OF MEMPHIS Memphis, Tennessee	11.00	.15	1.00							●			●	●	●											
FULTON NATIONAL BANK Atlanta, Georgia	7.00	.03	1.00	100.						●			●													
GENERAL ELECTRIC CO. Bethesda, Maryland	11.00	.33	1.00	10.00								●	●													
GENESEE COMPUTER CENTER, INC. Rochester, New York	10.00	.04	1.00	100.					●	●			●				●				●	●		●		●
GRAPHIC CONTROLS CORP. Buffalo, New York	10.00	.10	1.50	100.						●			●	●			●		●			●				●
HOBBS ASSOC. Corona Del Mar, California	6.00	NC	2.00										●													
HYPERMATION, INC. Cincinnati, Ohio	10.00	.15	1.00		NA	NA			●	●			●	●	●	●	●							●	●	
I.C. COMPUTER CORP. Tulsa, Oklahoma					20.00	NC		125.		●				●	●	●	●									
IKON DATA SYSTEMS Seattle, Washington				50.00	NC	NC		25.00																		
INFORMATION AND COMPUTING CENTERS CORP. Dallas, Texas				NC	NC	.30		1400.		●		●		●	●											
INFORMATION MANAGEMENT CORP. Pennsauken, New Jersey	10.00	.10	.75							●			●	●			●	●	●	●						
INFORMATION SCIENCES INC. Warwick, Rhode Island	9.00	.03	1.50						●				●		●							●				●
INFORMATION SYSTEMS CORP. Washington, D.C.	10.00	.10	.75							●			●	●			●	●	●	●						
INTERACCESS CORP. Palo Alto, California	NA	NA	.10		NC	.18				●			●	●	●											
INTERACTIVE COMPUTING CORP. Orange, California	10.00	.02	.80		NA	NA	100.			●			●	●			●		●			●				●
INTERACTIVE DATA CORP. Waltham, Massachusetts	13.00	.28	.20		8.00	.10				●				●	●	●	●	●					●			●
INTERFACE COMPUTER, INC. Salt Lake City, Utah	10.00	.10	.25	100.			150.					●	●	●			●	●								
INTERMAC CORP. Rochester, New York	12.00	.10	.30							●				●	●	●	●								●	
INTERNATIONAL TELECOMPUTER NETWORK CORP. Bethesda, Maryland	10.00	.08	1.00		90.00	.05				●			●	●	●			●								●
INTERNATIONAL TIME-SHARING CORP. Chaska, Minnesota	10.00	.08	1.00						●	●			●				●				●	●	●	●		
INTRANET INDUSTRIES, INC. Los Angeles, California	10.00	.18	.68	100.			100.			●	●		●				●									
ITS INFORMATION NETWORK CORP. Salt Lake City, Utah	6.00	.10	NA		NC	.14				●			●				●		●							
ITT DATA SERVICES Paramus, New Jersey	12.00	.11	.30				150.			●			●	●			●						●			
JOHN A. KEANE & ASSOC. Princeton, New Jersey	10.00	.10	.75							●			●	●			●	●	●	●						
KENTUCKY DATA SYSTEMS Louisville, Kentucky	9.00	.03	1.50						●				●		●							●				●
KPA TIMESHARING INC. Large, Pennsylvania	10.00	.10	.75							●			●	●			●	●	●	●						
LEASCO SYSTEMS & RESEARCH CORP. Washington, D.C.	5.75	NC	.75				100.						●													

General-Purpose Time-Sharing Survey

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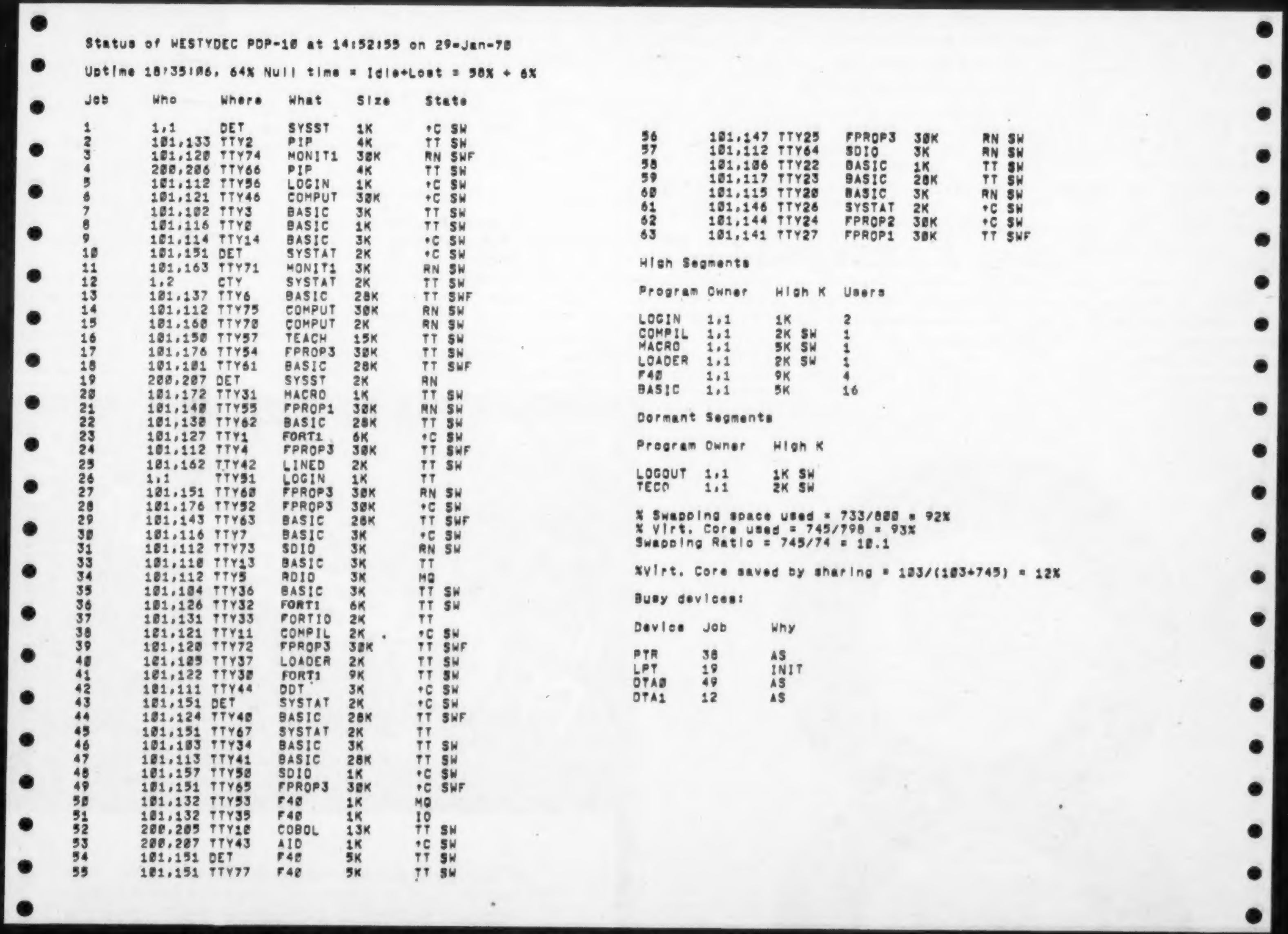
LOGI-CALL SYSTEMS, INC. Palo Alto, Calif.	3.00	.01	1.00				10.00		●				●		●		●									●
MACRO COMPUTER CONSULTANTS INC. Lansing, Michigan	11.00	.15	1.00								●			●	●	●										
MARKETING OPERATIONS, INC. Boston, Massachusetts	9.00	.03	1.50						●				●		●							●				●
MATRIX CORP. El Segundo, California	10.00	.28	.25		NC	.12				●			●	●	●			●								
MCDONNELL AUTOMATION CO. Saint Louis, Missouri	8.00	.20	.40	100.	8.00	.10				●			●	●			●					●				●
METRIDATA COMPUTING, INC. Louisville, Kentucky	10.00	.05	1.75									●	●													
MIDDLE ATLANTIC CALL-A-COMPUTER Columbus, Maryland	9.00	.03	1.50						●				●		●							●				●
MULTI-COMP, INC. Wellesley, Massachusetts	8.00	.20	1.00	100.						●			●													
NEW ENGLAND MERCHANTS NATIONAL BANK Boston, Massachusetts	9.00	.03	1.50						●				●		●							●				●
ON-LINE SYSTEMS, INC. Pittsburgh, Pennsylvania	10.00	.05	.30	100.			100.			●			●				●			●		●				●
PHILCO-FORD CORP. Philadelphia, Pennsylvania	9.00	.12	1.00		5.00	.08	25.00	100.		●			●	●	●											
PIEDMONT CALL-A-COMPUTER, INC. Raleigh, North Carolina	9.00	.03	1.50						●			●		●								●				●
PITTSBURGH NATIONAL BANK Pittsburgh, Pennsylvania	10.00	.02	1.00	100.	10.00	.01				●			●				●									●
PRINCETON TIME SHARING SERVICES, INC. Princeton, New Jersey	7.00	2.5	.10		NC	.30				●				●	●	●		●								
PROGRAMS & ANALYSIS INC. Waltham, Massachusetts	10.00	.06	.85	100.			100.			●			●													
PRYOR COMPUTER TIME-SHARING CORP. Chicago, Illinois	8.00	.05	.55	50,00			50.00			●			●													
RAPIDATA New York, New York	11.00	.05	.83	100.			100.			●			●									●				●
REALTIME SYSTEMS, INC. New York, New York	15.00	.13	.60	100.	NA	NA	500.			●			●	●	●											
REMOTE COMPUTING CORP. Los Angeles, California	5.00	.10	.50	25.00	10.00	.10				●			●	●	●			●					●	●		
SCIENTIFIC TIME–SHARING CORP. Washington, D.C.	12.00	.10	.30																						●	●
SCI-TEK COMPUTER CENTER, INC. Wilmington, Delaware	5.00	.30	.50		5.00	.20			●	●	●		●	●	●					●			●	●		●
SERVICE BUREAU CORP. New York, New York	11.00	.14	.50				100.			●			●			●										
SHARED COMPUTER SYSTEMS CORP. Chicago, Illinois	11.00	.18	.75							●			●	●	●											
I.P. SHARP ASSOC. Toronto, Canada	10.00	.13	.30																						●	
STRUCTURAL DYNAMIC RESEARCH CORP. Cincinnati, Ohio	11.00	NC	2.00	50,00						●			●													
SYSTEM DEVELOPMENT CORP. Santa Monica, California	9.00	.20	.03		NC	.12				●				●			●									●
SYSTEMS ANALYSIS CO. Birmingham, Alabama	9.00	.03	1.50						●				●		●							●				●
TECHNOLOGY FOR INFORMATION MANAGEMENT, INC. Albany, New York	11.00	NC	.50	50.00						●			●													
TELECOMPUTATIONS, INC. Silver Spring, Maryland	4.50	NC	1.00				25.00			●			●	●												●
TIME SHARE CORP. Hanover, New Hampshire	8.00	NC	NA										●													
TIMESHARE NETWORK CORP. Chicago, Illinois	8.00	NC	1.00							●			●								●					●
TIME-SHARING SYSTEMS, INC. Milwaukee, Wisconsin	11.00	.12	1.35		NA	NA				●			●	●	●											
TRACOR COMPUTING CORP. Austin, Texas			.07		NC	.25				●	●			●	●											
TRANSDATA CORP. Phoenix, Arizona	8.50	.20	.80	100.	NA	NA				●			●	●												●
TRANSNET CORP. Red Bank, New Jersey	10.00	NC	.75									●	●				●					●				●
TYMSHARE, INC. Palo Alto, California	18.00	NC	1.00				72.00			●			●				●	●			●	●				●
UNIVAC Blue Bell, Pennsylvania					9.00	.26		15.00 (RUN)		●	●			●	●											
UNIVERSITY COMPUTING CO. Dallas, Texas	7.50	.10	.50		NA	NA					●		●	●	●		●						●			●
U.S. TIME-SHARING INC. Reston, Virginia	10.00	.18	.25		NA	NA				●			●	●	●	●	●									
VIP SYSTEMS CORP. Washington, D.C.	3.50	NC	.16				100.			●				●		●	●									●
VIRTUAL COMPUTER SERVICES, INC. Union, New Jersey	9.00	.40	.12		NC	.30				●						●	●	●								●
WESTINGHOUSE INFORMATION SYSTEMS LAB Pittsburgh, Pennsylvania	10.00	.05	.60		12.00	.20	100.			●			●	●		●								●		

A USUAL THING HAPPENED WITH A PDP-10 THE OTHER DAY



```
Status of WESTYDEC PDP-10 at 14:52:55 on 29-Jan-70

Uptime 18:35:06, 64% Null time = Idle+Lost = 58% + 6%

Job     Who     Where   What    Size    State

1       1,1     DET     SYSST   1K      ↑C SW
2       101,133 TTY2    PIP     4K      TT SW
3       101,120 TTY74   MONIT1  30K     RN SWF
4       200,206 TTY66   PIP     4K      TT SW
5       101,112 TTY56   LOGIN   1K      ↑C SW
6       101,121 TTY46   COMPUT  30K     ↑C SW
7       101,102 TTY3    BASIC   3K      TT SW
8       101,116 TTY0    BASIC   1K      TT SW
9       101,114 TTY14   BASIC   3K      ↑C SW
10      101,151 DET     SYSTAT  2K      ↑C SW
11      101,163 TTY71   MONIT1  3K      RN SW
12      1,2     CTY     SYSTAT  2K      TT SW
13      101,137 TTY6    BASIC   28K     TT SWF
14      101,112 TTY75   COMPUT  30K     RN SW
15      101,160 TTY70   COMPUT  2K      RN SW
16      101,150 TTY57   TEACH   15K     TT SW
17      101,176 TTY54   FPROP3  30K     TT SW
18      101,101 TTY61   BASIC   28K     TT SWF
19      200,207 DET     SYSST   2K      RN
20      101,172 TTY31   MACRO   1K      TT SW
21      101,140 TTY55   FPROP1  30K     RN SW
22      101,130 TTY62   BASIC   28K     TT SW
23      101,127 TTY1    FORT1   6K      ↑C SW
24      101,112 TTY4    FPROP3  30K     TT SWF
25      101,162 TTY42   LINED   2K      TT SW
26      1,1     TTY51   LOGIN   1K      TT
27      101,151 TTY60   FPROP3  30K     RN SW
28      101,176 TTY52   FPROP3  30K     ↑C SW
29      101,143 TTY63   BASIC   28K     TT SWF
30      101,116 TTY7    BASIC   3K      ↑C SW
31      101,112 TTY73   SDIO    3K      RN SW
33      101,110 TTY13   BASIC   3K      TT
34      101,112 TTY5    RDIO    3K      MQ
35      101,104 TTY36   BASIC   3K      TT SW
36      101,126 TTY32   FORT1   6K      TT SW
37      101,131 TTY33   FORTIO  2K      TT
38      101,121 TTY11   COMPIL  2K      ↑C SW
39      101,120 TTY72   FPROP3  30K     TT SWF
40      101,105 TTY37   LOADER  2K      TT SW
41      101,122 TTY30   FORT1   9K      TT SW
42      101,111 TTY44   DDT     3K      ↑C SW
43      101,151 DET     SYSTAT  2K      ↑C SW
44      101,124 TTY40   BASIC   28K     TT SWF
45      101,151 TTY67   SYSTAT  2K      TT
46      101,103 TTY34   BASIC   3K      TT SW
47      101,113 TTY41   BASIC   28K     TT SW
48      101,157 TTY50   SDIO    1K      ↑C SW
49      101,151 TTY65   FPROP3  30K     ↑C SWF
50      101,132 TTY53   F40     1K      MQ
51      101,132 TTY35   F40     1K      IO
52      200,205 TTY10   COBOL   13K     TT SW
53      200,207 TTY43   AID     1K      ↑C SW
54      101,151 DET     F40     5K      TT SW
55      101,151 TTY77   F40     5K      TT SW

56      101,147 TTY25   FPROP3  30K     RN SW
57      101,112 TTY64   SDIO    3K      RN SW
58      101,106 TTY22   BASIC   1K      TT SW
59      101,117 TTY23   BASIC   28K     TT SW
60      101,115 TTY20   BASIC   3K      RN SW
61      101,146 TTY26   SYSTAT  2K      ↑C SW
62      101,144 TTY24   FPROP2  30K     ↑C SW
63      101,141 TTY27   FPROP1  30K     TT SWF

High Segments

Program Owner   High K  Users

LOGIN   1,1     1K      2
COMPIL  1,1     2K SW   1
MACRO   1,1     5K SW   1
LOADER  1,1     2K SW   1
F40     1,1     9K      4
BASIC   1,1     5K      16

Dormant Segments

Program Owner   High K

LOGOUT  1,1     1K SW
TECO    1,1     2K SW

% Swapping space used = 733/800 = 92%
% Virt. Core used = 745/798 = 93%
Swapping Ratio = 745/74 = 10.1

%Virt. Core saved by sharing = 103/(103+745) = 12%

Busy devices:

Device  Job     Why

PTR     38      AS
LPT     19      INIT
DTA0    49      AS
DTA1    12      AS
```

PRINTOUT FROM LINE PRINTER SHOWING SYSTEM STATUS OF 63 USERS ON PDP-10

Working multi-programming monitor. XDS hasn't done that.
8 different languages used simultaneously. UNIVAC hasn't done that.
63 interactive users on-line at the same time. Who do you know who's done that?
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Less than a million bucks. IBM hasn't done that.
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Future Time-Sharing Technology

The Telephone Company May Be the Biggest Problem

By Peter L. Briggs
CW Supplement Editor

Extended memories, specially designed logic circuitry, much faster control processors, and drastic revisions in the nationwide communications network represent the most probable changes in the nature of time-sharing over the next five to 10 years.

Many of these changes will have occurred within five years, but massive changes in the communications network will certainly require at least eight to 10 years, according to spokesmen for American Telephone and Telegraph.

Holographic Memories

Large-scale holographic memories for time-sharing and their use in business will support such major application developments as economical business modeling and corporate planning, stock market analysis with an adequate data base, and economic forecasting for entire segments of the nation's industry.

It seems reasonable that multi-trillion character memories with access times below 50 nanoseconds will be in fairly common use before 1975.

Time-sharing may provide economic pressure to develop the use of such memories for data base manipulation. There is relatively little requirement for on-line updating of such memories, so the absence of erasable holograms presents no particular problem.

Standard's IC-7000

Standard Computer Corp. is developing, in conjunction with Call-A-Computer, a specially designed time-sharing computer. The IC-7000 has programmable logic, so the user can redesign any part of the machine's internal processing as needs change.

This approach, programmable micro-programming, may represent the most advantageous use of current technology. It will permit far more experimentation at far lower cost. The resulting developments may speed the technological changes for time-sharing computers enormously, according to research engineers.

Central Processor Speeds

According to one of the research directors for IBM, the goal for the next generation of large-scale systems is to have a basic memory/machine cycle of one nanosecond. One nanosecond is the time it takes light to travel about 14 inches!

This represents an improvement of 50 to 1 over the current speed of the 360/195 (54 nanosecond!) This speed will be available, some observers think, within the next three to five years.

The most direct effect this speed improvement will have on time-sharing is the ability of a single computer to effectively support hundreds, perhaps thousands, of simultaneous users at response speeds similar to those now available for systems handling only 32 users.

This potential multiplication of the number of users of a single system creates the demand for the next critical technological improvement – high-speed, reliable, inexpensive, nationwide communications on a broadly available basis.

Communications the Limit

Though Bell Laboratories, AT&T's research division, represents perhaps the most concentrated and one of the largest operations completely devoted to research, it still requires decades to install, across the country, equipment to implement new discoveries.

Discovery of the laser, development of picture-phone units, basic research into all aspects of information theory and information distribution – these are only a few of the areas examined by Bell Lab's staff.

However, company spokesmen continually point out that with several million telephone instruments within the U.S. alone, and with many billions of dollars worth of existing equipment there is little possibility for major redesign or upgrading of the majority of this equipment within less than 10 years.

Costs Are Decreasing

Communications costs do continue to drop. Should some of the research now underway into laser-based switching systems prove serviceable, within 10 or 15 years, the cost for cross-country service might reach a price as low as current intra-city service.

The growth in demand for telephone services for information transmission – television, computers, possibly partial replacement of the postal service – so far exceeds the plans of the telephone companies that it will require several decades for the many affiliated companies to upgrade to meet demands.

There is no certainty that these companies can ever plan far enough in advance to cope with the growth in information transference. There is little or no motivation for the companies involved to really push for such rapid expansion.

Profit Motivation Missing

There is no profit motivation. The companies are limited to slightly over 8% in profits. The capital investment to upgrade the switched network runs well into the billions. The largest users of telephones, private individuals, are not complaining that bitterly over poor service.

Technology is not the problem in telephone communications. Currently, at least one firm will be operating in direct competition with AT&T for communications between Chicago and St. Louis – MCI.

This may represent an experiment on the part of the Federal Communications Commission in weakening the largest legal monopoly in existence in the country.

Prospective customers for the MCI microwave system are delighted with the cost reductions and the potential for far more rapidly expanding service. These customers are large companies with high demand levels for telephone service.

Such customers welcome the opportunity to let companies compete for their business.

The original need for the monopoly was the extreme size of the capital investment needed to establish telephones across the country.

Today other companies can raise sufficient capital to take over the job on a local basis, and are capable of devising the means to interface with the AT&T network where appropriate.

Several potential communications companies have indicated a willingness to pay AT&T for the partial rental of switching equipment to connect their services with the national network.

File Security Is Large User's Worst Problem

By Peter L. Briggs
CW Supplement Editor

As more and more large companies maintain their files of corporate information on time-sharing systems, the need for adequate file security becomes the most critical factor in deciding on new applications and selecting a vendor for the service.

Very little basic research has been done in the commercial environment on maintenance of secure data. The military, long conscious of the danger of computer-based data files, has spent millions of dollars finding new and more complicated ways to secure the safety of such data files.

Unfortunately for the commercial customer whose main fear is that other firms might obtain special financial or marketing information, the methods developed by the military are far too expensive, even if these methods were available to the public.

Company Claims Mean Nothing

Most major time-sharing vendors indicate that their files are completely secure from outside access. This is just plain not true: though other customers for the same time-sharing service may have some trouble finding your files and reading them, the employees of the time-sharing firm have no such difficulties.

It is possible to use a simple substitution code, particularly for numeric information, that is almost impossible to break without knowing the key to the code. IBM, for instance, is perfectly willing to make a Selectric ball having any pattern of characters on it that a customer might want, provided he is willing to order enough of them.

A firm could have several different types of Selectric balls made, one for each major type of application. The only printers that would produce interpretable results would be those using the right ball. This technique could be made as sophisticated as any company might wish, with rotation periods for the balls, and special cycles of use for each different application.

True, this would not solve all the data security problems. First, it would only work for numeric information. A substitution code for alphabetic information can be broken fairly easily, simply by knowing the statistical distribution of the letters of the alphabet. It would not, of course, eliminate the security problem.

The company using the system still must secure the pattern for using the type balls. It would remove the problem from the time-sharing company with little or no real experience in organized industrial espionage. The major companies in any industry are quite used to protecting themselves.

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Time-Sharing Advantages Are Based on Cost Savings

Peter F. Carr
CW Staff Writer

Two aspects of time-sharing – convenience and low overhead costs – make the service very profitable for both small and large users. Time-sharing can drastically reduce the fixed overhead costs for program development, engineering or scientific applications, and small-business processing.

Immediate response, a "built-in" benefit of time-sharing, both attracts new users, and encourages existing users to expand their use of such services.

Most time-sharing services devote their efforts to interactive or "pure" time-sharing. In this way the user converses with the central processor on an immediate-response basis, through a remote terminal.

Remote-batch processing is another method which uses a remote terminal to converse with the computer. This process does not fall within the strict definition of time-sharing, because it is not interactive, and the data is stored on some sort of queueing device until sufficient free time is available to process it on the computer.

Kind of Response

The convenience a user derives from either mode depends largely on the kind of response he wants from the system.

When the terminal user and the computer converse directly with each other, errors become apparent as they occur and can be corrected by the user while he is still on the system. Also, turnaround time is virtually eliminated.

The convenience of time-sharing is of great appeal to scientists and engineers who need fast turnaround time to increase their computational capabilities. They also need to use their time more efficiently.

Fast Response

Fast response, while not necessary in all applications, is an important feature. Increased productivity from scientists and programmers, reduced idle time, and improved communications between man and machine are possible.

A real-time system can also offer a problem-solver greater insight into the solution by testing on-line, numerous alternatives and giving immediate results.

This interaction with the computer frequently provides a quick understanding of a problem that could prove more difficult to solve with longer turnaround time.

Greater Control

For the businessman, real-time information systems and the reduction in processing time allow greater control over inventories.

Real-time data processing is also convenient for the customer who needs faster response to his orders and requests for information. If improved service is more important to a customer, relative to other variables such as cost or quality, a user of a real-time system can gain a considerable competitive advantage.

Remote Batch

Users of the remote batch type of service can also take advantage of fast turnaround time. After processing, the data may be transferred back to the queuing device for tranmission to the terminal or it may be printed and mailed back to the user.

Remote batch also allows more information to be processed since cards or tapes can be prepared off-line and then fed in a batch mode to the computer. Terminal line printers also make available larger files of output data.

Less Overhead Costs

The user of the remote batch system does not have the same overhead costs in using the interactive mode. A computer that talks to the user is expensive, and may not be the most efficient way to use the machinery. Remote batch has a lower priority on the system, and in this way allows the computer to use its resources more efficiently.

The actual computer work accomplished will be less, since the interactive time-shared computer has to spend some if its time housekeeping.

The combination of less need for instantaneous response and the greater input/output capacity of remote batch makes the system appropriate for most commercial accounting type operations, according to many system designers.

Programs Available

Perhaps the principal advantage attached to time-sharing is that such services already have fully developed program libraries available for the customer to use. Much of the reinvention-of-the-wheel type work that has characterized computer installations is eliminated. Program libraries represent significant savings in time and money, and are extremely comprehensive.

Companies with in-house systems often tend to under-utilize the system since enough equipment has been installed to handle peak loads effectively. Many parts of the system lie idle when smaller jobs are being run.

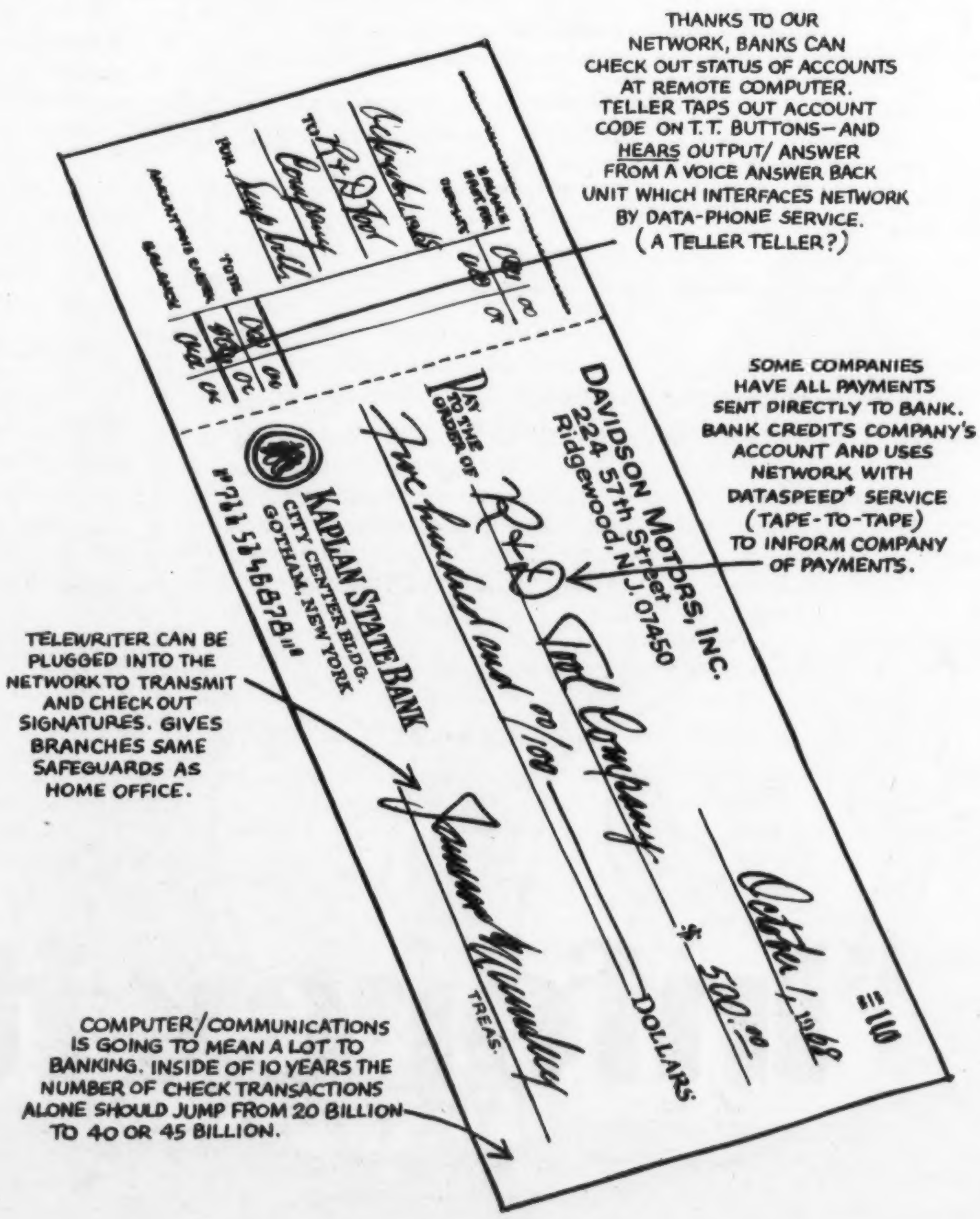
Cost Expenditures

The advantage to a time-sharing user is that he pays only for what he uses. He gets a high level of service without a large initial cost to obtain the equipment. His cost expenditures consist only of a terminal, communications charges, and the amount of CPU time used.

With time-sharing, the user is in the happy position of getting a piece of a computer much larger and more sophisticated than he would normally install in-house, without the headaches.

Because costs increase arithmetically while the actual time required to do a given job decreases geometrically with larger and larger machines, the users get lower costs for CPU-oriented processing.

Finally, smaller companies avoid the management and installation costs that would be required for the smallest in-house system. This minimization of overhead costs can represent a larger amount of money than the total monthly bill for a time-sharing service, according to many users.



THANKS TO OUR NETWORK, BANKS CAN CHECK OUT STATUS OF ACCOUNTS AT REMOTE COMPUTER. TELLER TAPS OUT ACCOUNT CODE ON T.T. BUTTONS – AND HEARS OUTPUT/ ANSWER FROM A VOICE ANSWER BACK UNIT WHICH INTERFACES NETWORK BY DATA-PHONE SERVICE. (A TELLER TELLER?)

SOME COMPANIES HAVE ALL PAYMENTS SENT DIRECTLY TO BANK. BANK CREDITS COMPANY'S ACCOUNT AND USES NETWORK WITH DATASPEED* SERVICE (TAPE-TO-TAPE) TO INFORM COMPANY OF PAYMENTS.

TELEWRITER CAN BE PLUGGED INTO THE NETWORK TO TRANSMIT AND CHECK OUT SIGNATURES. GIVES BRANCHES SAME SAFEGUARDS AS HOME OFFICE.

COMPUTER/COMMUNICATIONS IS GOING TO MEAN A LOT TO BANKING. INSIDE OF 10 YEARS THE NUMBER OF CHECK TRANSACTIONS ALONE SHOULD JUMP FROM 20 BILLION TO 40 OR 45 BILLION.

The Financial Viewpoint

Time-Sharing Takes a Large Investment: Returns Slow

By Peter F. Carr
CW Staff Writer

At the end of 1968 about 75 independent companies offered time-sharing services. By the end of 1969 the figure had reached 170.

These figures suggest that time-sharing is a booming business, and it may be, but only for a small percentage of the companies engaged in it. Of the $100 million expended in this area, the equipment manufacturers received 53%, a group of about six or eight companies got 17%, while the remaining 30% was divided among the other 160 companies.

The emphasis so far has been more on growth and technological development rather than on profit. But there is a limit to the amount of capital that can be laid down for investment purposes, especially at today's inflated rates.

Since time-sharing on a computational basis is not generally considered a profitable business, the above figures suggest a large-scale departure of many of the smaller time-sharing companies and a large-scale merging of others. No individual service company or group of companies controls a significant share of the market.

At best, traditional computational time-sharing is only marginally profitable. Consequently, the real growth in remote access computing over the next few years will be in areas other than strict computational time-sharing. Many of the large service bureaus are already heading in this direction, and are offering all their services to a limited group of selected industries.

Indications are that the professional computer service company will provide a viable alternative to the user who might consider the installation of an in-house system.

Many factors influence the choice between an in-house system and a service bureau, but most are based on cost and the definition of the use of the system.

If the user is tied in to a service bureau and sees his bills stacking up, he will usually be willing to set up his own system if it meets the majority of his needs. With an in-house system, he could develop or buy the software and know that it would handle everything that was formerly handled on the outside system.

Secondly, if the user was developing his own in-house package – the beginnings of a management information system – which he felt was crucial to his business and wanted control over it, he would consider an in-house system. A third factor in that the user simply wants control over his own system.

On the other hand, if the user is subscribing to eight or nine different services for their software rather than for their services, an in-house system might not be enough to handle the work. Also, it may be cheaper to use the service bureau if the service is used for many different purposes, rather than developing or buying the software and letting it sit in-house with only limited use.

As companies get larger, the very large corporations will look very carefully at doing all their computing in-house. Also, if the use is large, but the scope of the use is narrow, the user will benefit from installing a smaller systems, such as DEC or Hewlett-Packard minis. Costwise, these are small systems.

The advantage of such mini-systems is that the user has complete access any time to the system.

putational time-sharing is the user has access to a much bigger machine, and has more scope for doing complicated calculations than with a mini.

Since prices for minis are being reduced each year, minicomputers will inevitably find some support relative to time-sharing through a service bureau.

If the user wants a small system to do programming or mathematical-type calculations, three choices are available: he can hook up to an outside time-sharing service; he can buy a couple of minicomputers; or he can install an in-house mini time-sharing system.

The problem with minicomputers is that the user does not receive a great deal of software support because of the low price. But minis have their place as alternatives to time-sharing, in many cases as components of systems, for which they are now used to some extent.

Time-sharing is not the panacea for all computing. There are many problems which are well-adapted to it and many that are not.

Both minicomputers and in-house systems have their uses, and can be seen in some instances as preferable alternatives to time-sharing. But the final decision rests with the user.

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Time-Sharing Inter-Compatibility Saves Users Money

By Peter F. Carr
CW Staff Writer

Users can save money, time, and effort by switching around between different time-sharing services.

One unique feature of time-sharing which enables users to switch is its tendency to be similar in general capability and language among most of the hundreds of suppliers of this type of service.

By taking advantage of this compatibility – a compatibility that is needed by new companies who wish to steal customers away from other companies and is sought by users because it minimizes the user's conversion and adjustment problems – users may move applications from one service to another as new features make one service more attractive than an older service.

Vendor Pressure Helps User

This ability to switch between services also puts pressure on the vendors of time-sharing to provide more and better services. Vendors must continually upgrade the service they offer, simply to keep existing customers.

The customer is unlikely to switch between different services if his existing service offers him the specific abilities he wants for what he considers a reasonable price.

No two time-sharing companies offer exactly the same combination of packages, services, languages and price. Time-sharing companies are tending toward specialization to secure a profitable position in this highly competitive marketplace. This tendency can make it difficult for a user to find the best combination. Specialization tends to reduce the number of firms offering a given combination of services.

Specialization Is the Key

General Electric is generally considered the leader in the time-sharing market and it is difficult for a rival company to compete directly with GE in the field.

The successful companies are the ones which concentrate their marketing efforts in specialized areas. As a result, many so-called general purpose services are oriented more in one direction than in another.

For example, Westinghouse maintains a general purpose system in many areas but has a very large numerical control package. This includes keeping a number of financial analysts on-line, and maintaining a large base of stock market data and financial information. This is done to concentrate its services and maintain a firm hold on the financial application area.

From the user viewpoint not all companies offer the same degree of complete services. Some systems support only one language.

Language compatibility is not considered to be a problem in switching. Unless a programmer is using some sophisticated enhancements to the language or extraordinary commands, switching languages among services presents few complications.

The costs involved in switching from one service to another are usually negligible.

But when the user is switching a large application, programs may have to be rewritten, and new problems arise. This happens most often when the user is switching from a service like GE's to a service bureau-type system.

User Reads Data-file Directly

In the GE service, the user can read his data-file directly. In the service bureau, he must go through a special program.

The majority of large users at the corporate level subscribe to many services, and use them both in case of equipment failure and for back-up.

Large users find that it pays to be tied in to more than one system. Even if some duplication is involved, it secures backup.

In real-time systems, the penalty for equipment failure is high. In effect, the time required to repair breakdowns is a time when the system can only operate spasmodically, if at all. This could leave a one-service user stranded.

When a user has to run a job at a certain time every week, it is almost mandatory that he be tied in to a second system. If one system is down when it is needed, he can run his package on the backup system.

Users also have found that using all of a system's special features is not the safest way to use the system. By locking himself into a system in this manner, the user runs the risk of losing compatibility. The easiest way to avoid this problem is to establish guidelines that will not allow users to take advantage of special features on large or critical programs.

One use for switching services is not usually a permanent arrangement, but a temporary one to enable the user to optimize his output. In some cases, especially if the user is moderately large, the pressure not to switch is great.

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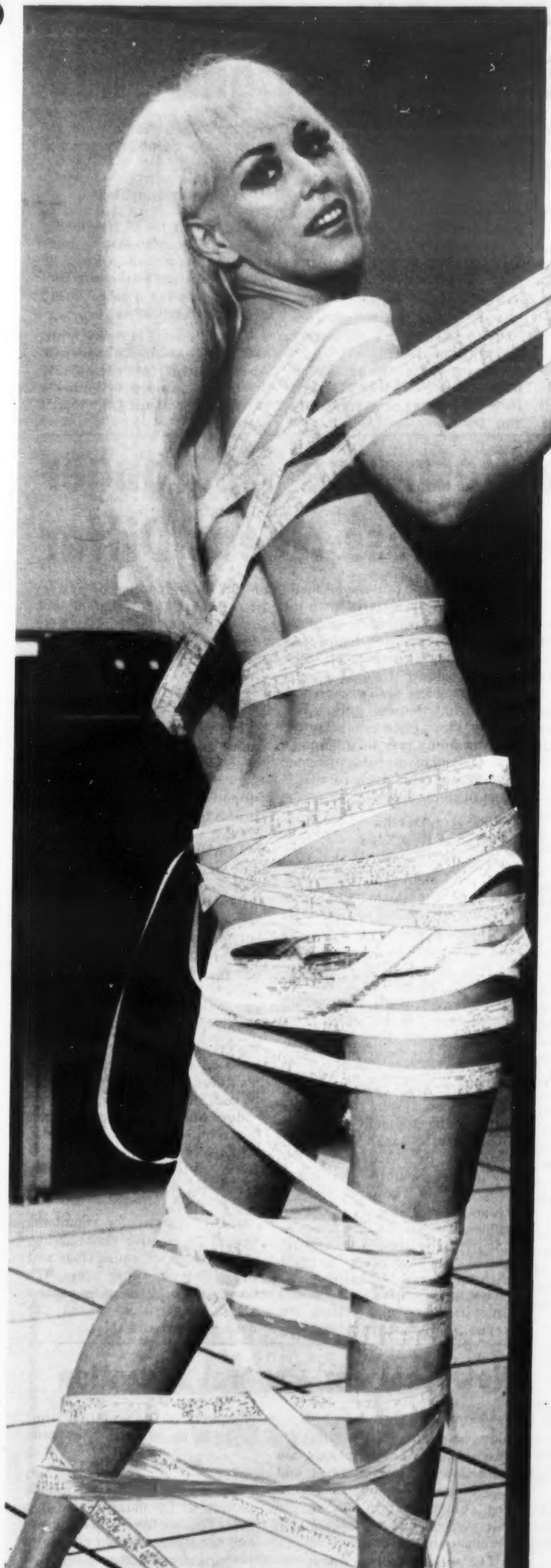

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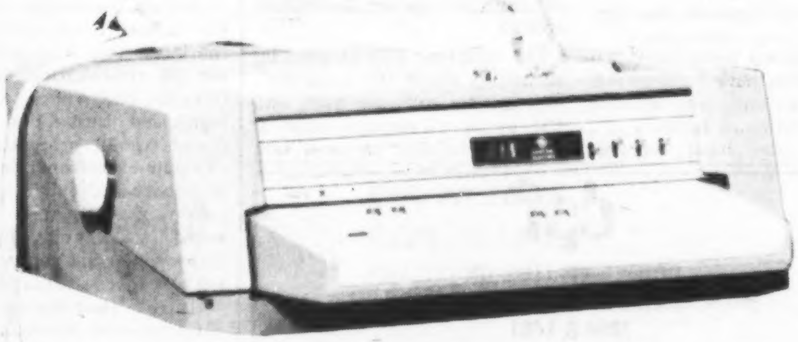

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Unreliable Time-Sharing Costs Users Money and Time

By Peter L. Briggs
CW Supplement Editor

Reliability probably causes more complaints, both from the customers and from the company itself, than any other single problem area in time-sharing, according to many users and company executives.

For the customer, lack of reliability means higher costs, wasted personnel time, and possible direct loss of effective use of files or programs that must be recreated, generally at the customer's expense.

For the time-sharing company, lack of reliability costs many dollars in lost revenue, lost customers because of frustration, and a bad image among time-sharing users. The image problem probably offers the most severe potential loss, according to the president of one firm.

Time-sharing users frequently talk with each other. If a company cannot maintain its service during a large majority of the working hours, new potential customers simply aren't interested.

Partially Machine Dependent

Certain machines, at one time or another have acquired reputations for poor hardware reliability. This was particularly true of the XDS 940, one of the earliest commercial time-sharing machines still in extensive use.

Some existing users think that the problems have been solved, but there are still many reported cases of continuing failure.

On the other hand, the Burroughs B5500, another very early time-sharing machine, offers an extremely high level of reliability.

One firm that uses a Burroughs machine is experiencing less than 1% downtime. Other Burroughs users have reported similar lack of machine failure.

The newer computers like the XDS Sigma 7, the IBM 360/67, the RCA Spectra 70/44 or 70/61, and the Standard IC-7000 offer much higher mechanical reliability. This is attributed to the use of integrated circuitry, better maintenance, and better engineering.

Ways to Find Out

The most successful way to find out about the relibility of a company's time-sharing service is still to contact a handful of its regular customers. Should the company prove reluctant to provide such a list, the user should go somewhere else. There is no shortage of competition for a user's money, and most companies will be more than cooperative.

Some information can be obtained from published studies and directories.

Time-Sharing Enterprises, Inc. publishes a Time-Sharing Industry Directory that discusses most of the time-sharing companies around.

The directory lists detailed information about the company's system, the software used, and the scope of services offered. This can be used as a selection guide, but it would still be advisable for a user to seek out other customers, particularly ex-customers, for corroberative opinions.

Software Reliability

Though much less a measureable quantity, the reliability of the systems software should be considered. *Computerworld* frequently has examined time-sharing systems from a software viewpoint.

Compiler problems, data management problems, command-language problems, and inadequate debugging of software present users with many potential problem areas. A one- or two-month test period should reveal most of these problems.

The time invested in testing out the system on a free basis could well save a company far more money than the time and manpower for testing would cost. Most time-sharing companies offer test and trial periods. Even the largest continue to provide an initialization period for new users.

When using multiple services, it might be useful to take programs from an existing program library and try them out on a new system. This should indicate most major problems quickly and painlessly.

The Shakeout Helps

The paring away at the smaller firms in the time-sharing business, and the overall shakeout of the time-sharing market are providing users with some guarantee of reliability.

Unreliable services are suffering most in the cut-backs in growth. These firms are frequently under-financed, and will quickly succumb to pressure from loss of sales.

Immediate Response No Longer The Goal—Business Needs Differ

By Peter Carr
CW Staff Writer

Eight years ago, immediate response was the principal goal of time-sharing, then called multi-access computing. Today, the goals are quite different.

True interactive processing has been relegated to its proper place as an expensive but valuable means to solve certain special kinds of problems.

Cheaper processing methods like remote batch are replacing the interactive or conversational use of time-sharing. Organizations are now willing to sacrifice high-speed turnaround for reduced overall processing costs.

Certain exceptions, particularly in science and engineering, education, and program development, do require high-speed turnaround, and can be benefitted by conversational processing.

"Pure" time-sharing implies conversational processing. However, time-sharing has come to include the idea of a remote-batch type of processing for business use. Remote batch provides the power of a large computer in the multi-access user environment at a much lower cost than the rental of such a computer for an in-house installation.

Many time-sharing companies feel that remote-batch processing will be a much larger part of their processing than will interactive time-sharing within the next three or four years.

Where Immediate Response Applies

In the education environment interactive processing provides a convienient tool to instruct students in the use of the computer, and in many academic subjects.

An excellent example of this use of time-sharing is the Dartmouth College Time-Sharing Center, the pioneer of Basic.

Commercial applications like airline ticket reservations, stock market quotations, and inventory order processing do require immediate response. Someone is waiting at the other end for the answer.

In this type of application, the user makes very small demands on the computational ability of a computer. The demand area is that of data retrieval and file updating.

With this type of demand load, one generally associated with information retrieval systems, comes the need for high-speed turnaround at whatever cost must be paid.

Most business systems, on the other hand, require only a relatively slow response. Minutes, or even hours may be unimportant. Overnight probably offers a sufficiently rapid cycle to satisfy most business needs.

Program Development — A Real Need

Interactive program development and debugging may well represent the single most valuable use of interactive time-sharing, according to many managers and development programmers.

Using time-sharing, the programmer can let the system do most of the work in program preparation and debugging. This does increase the computer-usage time for program development.

One large bank currently using an in-house system for on-line program development feels that, though total seconds of CPU time may be twice as high for on-line programming over batch programming, the clock time or programmer's time for the development might be as little as one-fifth the time normally required. The bank is very satisfied with the overall cost savings.

The programmer spends his time designing and testing the actual program, not playing around with coding or system problems. The programmer's time is much more effectively utilized, and he is able to spend more time doing more productive work.

Industry Needs Are Different

The value of immediate response for business and industry use is very limited. The cost of this high speed is too high to be supported by the type of applications involved.

"Why should we pay more for additional hardware and software and swapping programs in and out just to give someone a little interplay?" one user asked.

"I'd much rather use a remote batch terminal, and connect it to the largest machine available. It will get the job done just as quickly and at less cost," he added.

"But the extra cost [for conversational processing] is justified only if there is a real need for immediate response." he continued.

Most business applications can use remote batch processing as effectively, perhaps more effectively, as they can interactive processing, but at much lower cost.

Despite the growing arguments against interactive time-sharing, it is needed in some areas and convenient in other areas. It's completely useless in many areas. Where it is needed, the need remains critical.

New Tool For General Education

(Continued from Page S/2)

vides many auxiliary services for the schools. These include aid with system malfunctions and programming problems, fostering communication among the participants, and sponsoring conferences and training sessions.

The project findings reveal:

- The computer is best used for exploring problems of personal interest to the user, that is, as a creative outlet for his curiosity.
- Developing the ability to program is a matter of a few hours.
- The average student can learn to program in the seventh grade.
- The major influence a student's ability has on using the computer is the length of time required to write the program.

Results of Project

The results of the Dartmouth project so far indicate that it is quite feasible for smaller colleges and schools to obtain computer resource from a remote supplier.

Not only are they able to obtain computing power in almost the exact quantity needed, but they are able to do so without significant investment. They are able, in a very short period of time, to shift to a different supplier should it become necessary.

Today, over 80% of the students know how to program a computer, and hundreds of them use it daily.

Time-Sharing Growth: A Communications Phenomenon

By Peter F. Carr
CW Staff Writer

During the last two years more than 150 companies were formed to supply time-shared computerized services. This, in itself, is a significant development in the growth of the computer industry.

Because of the concept of time-sharing in conjunction with the telephone system, computer services are now within the reach of small businesses, schools, engineers, scientists, and even football coaches.

Time-sharing may be described as the almost simultaneous use of a computer facility by a number of independent users of multiple terminals.

The terminal usually employed is a teletypewriter or other keyboard device which may be accompanied by a television-like CRT display.

People using such terminals generally perform simple calculations or write computer programs. The data input is normally small and the program relatively short. The computer response is conversational with each person using the computer as if it were completely under his control.

For example, a programmer can check his work when compiling his program; a scientist can use the time-shared terminal to perform complicated calculations; a financial analyst can do long-term analyses of prospective companies with the help of the time-shared computer.

Purpose

The purpose of time-sharing is to minimize the time needed from the definition of the problem to its final solution. By optimizing the computer resources through reduction in usage time, costs are lowered.

Time-sharing is both a technology and a service. To meet the demands of multiple users both hardware and software have been developed which make facilities available to the time-sharing user that are not offered on the batched processing computer. In addition, time-sharing has helped develop the technology of remote communications and sophisticated terminal devices.

Function

Time-sharing performs two major tasks. It handles communications for its multiple users almost simultaneously and handles each task on the central processing unit by means of an ordering process called queueing.

The speed of the CPU limits the number of terminals. Consequently, high speed random access devices for external storage are a necessity.

The time-sharing user is connected to the main processing unit through a communications network such as the Bell System. The speed of the large computers allows the user an almost immediate response.

The flexibility and simplicity of the system enable him to work directly with the computer, making possible quick analyses and instant decisions.

Development

Many of the concepts behind time-sharing were developed at the Massachusetts Institute of Technology. In 1959 and 1960, technical papers by members of this community described the potential advantages of time-sharing. By the early 1960s prototype systems were demonstrated.

One member of this community who was deeply involved in the early papers and experimentation is J.C.R. Licklider, often called the "father of time-sharing."

Licklider, who described the symbiotic relationship between man and machine as "an unexpected development in cooperative interaction between men and electronic computers," helped secure funding for several of the important experimental systems including the largest and most famous – Project MAC.

Mac is an acronym for Multiple Access Computing and Machine Aided Cognition – that is, a learning process that is assisted by machines. ‘Its purpose, according to its first director, was to provide men's minds with "intellectual tools." Terminals for these new power tools became available at certain universities and research institutions in 1963.

Remote terminals provided access for up to 30 users with the MIT-developed Compatible Time-Sharing System (CTSS) which was implemented on an IBM 7094.

IBM's Entry

IBM entered the commercial time-sharing field in 1964 with the Quiktran system running on an IBM 7040/7044. Quiktran provided users with interactive capability for mathematical problem-solving. General Electric entered the field as a result of a joint venture with Dartmouth College. The Dartmouth system saw the development of the Basic programming language. Basic was designed under the direction of Profs. John Kemeny and Thomas Kurtz through a National Science Foundation grant.

The first time-sharing system became commercially available with the introduction of the GE 235 System in 1965.

In the same year time-sharing accounted for about $10 million in revenues. By 1968 the market had hit the $55 million mark. Some analysts estimate that the market will reach $350 million by 1971 and $500 million by 1975.

Principally because of the ease of entry into the time-sharing market, more than 300 computer systems are being used today by commercial time-sharing services.

As a result of this increased activity there has been brisk competition.

This competition takes several forms: price cutting, special inducements to try time-sharing, and deals for special programming assistance. Competition also created a problem for the smaller companies. By the time they get their customers built up to a high volume, they will have spent many years and many millions of dollars, and in many cases they will have shown only negative profits.

Four Distinct Participants

There are four distinct types of participants among the companies offering time-sharing.

The mainframe manufacturers with computers readily at their disposal are the most logical entries. Today there is no major manufacturer who is not either in the time-sharing business or preparing to get into it.

The second type of company is the one that for several years has supplied traditional data processing services, generally as a batch service bureau.

Third are the independent services begun by entrepreneurs. Among these are some of the first services that have struggled along for years and still hope to show a profit. The majority of the newer entries fall into this group.

The fourth comprises those organizations that traditionally have been large computer users – banks and large industrial users. Such firms have decided that they can make money by selling their knowledge to others. In such operations, profitability is not a problem because the parent company is already absorbing the hardware cost and is attempting to obtain a partial return on its initial outlay.

Time-sharing has grown rapidly over the past decade. It is likely that services based on time-sharing techniques will have a significant effect on the way businesses are conducted in the future and in the manner in which scientists and engineers solve their problems.

To meet such expansion, there will be a growth in the need for terminal equipment, specially developed time-sharing computers, and more highly developed communications networks.

The Family Approach

The Scope of IBM's T/S Software Points to Conflicts

By Peter L. Briggs
CW Supplement Editor

IBM offers the most comprehensive group of time-sharing software and systems available from any manufacturer. This fact follows the recent announcement [CW, Dec. 17] of the Time-Sharing Option for the full 360/OS, and the Interactive Terminal Facility for 360/DOS.

Almost all the different types of time-sharing software technology are represented. They include swapping, interpretive compilers, virtual memory, remote job entry, full-scale compilers, interactive execution, interactive debugging, remote batch, multiple-speed terminals, eight or ten different languages, and complete flexibility on data management and file organization.

Compared to the offerings of any single time-sharing company, the features are many. They are spread among 10 different software systems. The different types of time-sharing mostly run under the principal 360 operating systems, DOS and OS.

The best way to time-share data processing is still unclear, if the number of different types of time-sharing provided by IBM is any indicator.

IBM Motivation

Three ideas underlie IBM's marketing philosophy. First, IBM would only offer one type of time-sharing if that form of time-sharing would serve all needs.

Second, IBM's main concern is still to sell or rent more computers.

Finally, IBM also likes to minimize its investment in any peripheral function, such as software development.

In-House vs. Remote

Even within IBM, the conflict between in-house based time-sharing and remote time-sharing services continues.

IBM has offered Quiktran for several years. It added several other languages via Call/360. After offering Basic, Fortran, and Datatext services for a few years, IBM began releasing time-sharing systems for its equipment customers. This software offered competitive services, and relieved the pressure on Call/360.

Datatext has been discontinued. Other Call/360 services may be discontinued within a few months. The Service Bureau Corp., IBM's remote service arm, operates independently from the Data Processing Division, at least in theory.

SBC's marketing, however, reflects the long-range planning of the entire corporation. When IBM decides that it wishes to emphasize equipment rentals and sales, then its services are discontinued over a period of time, and its salesmen are particularly encouraged to contact existing Call/360 customers to offer equipment.

Industry Needs Vary

There is no universal agreement on what time-sharing is. Different users demand different results from a time-sharing system. All of these systems fall under the definition of remote processing, and nearly all of them are time-sharing.

Time-sharing was the name developed from the original MIT term—Multi-Access Computing (project MAC).

It has become a little more specialized to exclude those uses in which the users are not being swapped in and out of the machine in some sequence. This definition includes nearly every type of remote computing being offered by IBM.

Users may require several outside service suppliers to satisfy their needs, based on IBM's reasoning.

The concept of the 'computer utility' may be obsolete already, before it has properly been implemented.

The idea of a single giant installation handling all the differing needs of dozens of different industries and hundreds of individual users appears unreasonable, when the actual scope of these needs are viewed through IBM's apparent planning, and the scope of IBM's existing software.

IBM may be planning to incorporate the ideas of a remote access computer into its next generation. This approach, if IBM decides to emphasize it, will essentially force users to rethink their application plans into the remote-access mould. As with the introduction of the System/360, the user must react to his environment and its changes, rather than plan his environment to suit his expected needs and goals.

IBM SYSTEM/360 TIME-SHARING PROGRAMS

Name	APL/360	CALL/360-OS	CP-67/CMS	CPS	CRJE	CRBE	RAX	TSS	TSO	ITF
Operating system	DOS and OS (MVT)	OS (MFT-II)	None (3)	OS (MFT-II, MVT)	OS (MFT-II,MVT)—	OS (MFT-II,MVT)	None (standalone)	TSS has its own operating system services	OS (MVT)	DOS and OS (PCP, MFT,MVT)
Terminals (1)	1050, 2740, 2741	2741, TTY	1050, 2741, 2250, TTY	1050, 2741, TTY	1050, 2740 2741	1050, 2740, 2741, 2260R	1050, 2741, 2260 (L), 2450/1403, TTY	1050, 2741, TTY	2741, 1050, TTY	2741, TTY
Minimum CPU	192K (DOS) 384K (OS)	384K	360/67 256K	256K (LCS-supported but not required)	256K	256K	64K (4)	360/67, 512K	384K	OS - 64K Dedicated 128K TS and Batch DOS - 48K Dedicated 64K TS and Batch
Interactive execution	Yes, Interpretive Code	Yes, Object Code	Yes, code depends on operating system used	Yes, Interpretive Code	Job preparation is interactive-execution is not		Yes, Object Code	Yes, Object Code (8)	Yes, object code	Yes, Object code
Languages (5, 6)	APL	BASIC PL/I FORTRAN	Those of OS, DOS-also FORTRAN Assembler F, and others under CMS (11)	BASIC PL/I	N.A.	N.A.	BAL FORTRAN	Assembler FORTRAN PL/I (3Q70) (10)	BASIC, Code and Go FORTRAN Subset PL/I and all OS compilers	BASIC Subset PL/I
File I/O	No	Yes, data sets not OS-compatible	Yes	Yes, data sets are OS-compatible	N.A.	N.A.	Yes	Yes	Yes, all OS data management	Yes
Desk calculator facility	Yes (7)	No	Yes	Yes	No	No	No	In PCS	Yes	Yes
Low-speed RJE	No	No	Yes	Yes (9)	Yes	Yes	No	Yes (2); also high-speed RJE	Yes	No
Syntax analysis	As statements are executed	No	Function of system in use	PL/I, BASIC	FORTRAN PL/I as options	FORTRAN as option	No	Yes, optional	FORTRAN, BASIC, PL/I Subset and PL/I	BASIC and Subset PL/I

Notes:

1. TTY refers to TTY 33/35 terminals or other fully compatible terminals.

   Terminals which are equivalent to those explicity supported may also function satisfactorily. The customer is responsible for establishing equivalency. IBM assumes no responsibility for the impact that any changes to the IBM supplied products or programs may have on such terminals.
2. Foreground jobs may be moved to background with no changes; also, jobs may be initiated in foreground and moved to background to complete execution.
3. CP67 is a special control program — allows operating systems to run under it.
4. RAX requires 128K to support 2260s.
5. Refers to those languages in which the user can write interactive programs.
6. All the features of the languages referenced may not be supported; check the language reference manual for the corresponding time-sharing system.
7. Design of APL makes full facilities of the system available in this mode.
8. Has facilities (Program Control System) to assist in debugging and manipulating compiled programs.
9. Foreground jobs moved to background may require modification.
10. BASIC is also available, but as a Type III program.
11. Systems like RAX and APL/360 may be run on the virtual machines created by CP-67.

A Manufacturerer's Viewpoint

Minicomputers Can Time-Share Well But Have Limits

By Walter C. Friedrich
Special to Computerworld

Minicomputer time-sharing can offer users better economies for time-sharing.

This may be a bold statement, and it is only partially true. Lower cost? Yes. Equivalent performance? Hardly.

Unless a user is only concerned with one, perhaps two, languages, the system cannot perform in direct competition with a full-scale computer in a time-sharing mode.

But, if the user is in the 10-character-per-second terminal environment, and that's really what time-sharing is all about, he can get the same performance from a minicomputer as he could from a 360/67 doing the same things.

The Small User's Voice

Of the many viewpoints one can take, regarding relative performance between large and small systems, all the commotion eventually must end and leave just one little voice ringing clear.

It is that of the user who wants to talk only one language, who wants to run short programs now and then, who needs to communicate with his programs interactively, and who wants to minimize cost while doing it.

He doesn't need to crunch a lot of numbers in microseconds, and generally welcomes the opportunity to get his jobs done quickly at as low a cost as possible.

The true measure of "equivalent performance" must be from the point of view of the user who pays the bills for time-share services rendered.

He'll consider the system that takes 20 minutes to do a routine at $5 per hour as being "equivalent" to the $20 per hour system that takes just 15 minutes.

The faster-CPU argument doesn't apply in the general case: time-sharing exists for the conversationalist, where terminal speed is the equalizer.

It takes just as long to print out the results of a routine taking 10 milliseconds of big-machine CPU as one that takes 100, or even 1000 milliseconds in a minicomputer CPU.

How Are Minis Cheaper?

Why the "minis" can provide lower-cost service is easy – they cost less. They are less in every way, not just when purchased or when the lease invoices are paid. There is less cost to turn on and to keep up.

The name of the game is very simple: overhead. The number of actual user-hours per month is almost fixed and, in combination with overhead, determines what the actual hourly rate must be to stay in business next year. But more on that shortly.

First, let's agree that something-for-nothing still is the hardest thing to get. If the objective is to support batch/remote batch, Basic, Fortran, plus any or all other languages from the menu, the software needs to sustain it all.

It's hard to push all that software capability into 16K or 24K, of say, 16-bit words. Even using a disk to hold sections temporarily not in use requires an executive routine somewhere just to do the housekeeping, and that "somewhere" is usually called "core."

The access time every time a swap of executive routines is called for adds to system overhead and detracts from response time.

Response time is probably the single most important factor, except for downtime and dollars, that the time-share user is concerned about.

All this means that "big" software requires "big" core and, frequently, peripheral processors to help out with things like answering the telephone, fetching from the disk, updating the tables . . . being a regular "gofor."

From the user's point of view, the axiom is not "bigger system, better system," but "my language, my time, my money."

Costs Are Compared

Explore why costs are what they are: a $50,000 per month leased system, just as a $100,000 purchased system, required care and feeding.

Some simple arithmetic shows that when telephone costs, electricity, air conditioning systems, floor rental costs for required system environment, operators' and programmers' and salesmens' overhead costs, and all the rest of the overhead figures are added to the system's monthly lease, a figure of about $100,000 per month gross cost is not unlikely.

But now look at the actual monthly user-hours one might expect: many large systems shut down nights and are available only, say, 12 hours per day, 26 days per month. How many simultaneous users shall we pick: 50? That makes 15,600 terminal-hours available monthly to pay for a $100,000 monthly overhead and, hopefully, make a little profit.

All lines won't be up all the time. Some judicious juggling of numbers might generate a 40% efficiency figure, for which a reasonably strong case can be made: 40% of 15,600 is 6240 actual terminal-hours, monthly, that might be anticipated by a reasonably effective time-sharing facility. Dividing $100,000 by 6240 comes out rather close to $16 per hour to break even.

Not a very technical approach, perhaps one that might even disturb an accountant, but certainly a practical method of evaluating what's needed per hour to cover the costs.

$2500 Per Month

To be fair, look at the minicomputer, costing $100,000 or so, that talks only one language. It leases for $2500 per month, but four such are required for comparison to get up to close to 50 ports, (they probably handle just 16 per system), $10,000 monthly for lease.

The controlled environment is unnecessary, since the relatively simple hardware isn't too unhappy with several degrees temperature variation or some line voltage fluctuation. Full-time operators and technicians are avoided, and programming staff requirements are minimal to support the system software.

The software itself is relatively simple, needing to support so much less capability than its bigger brother. The system can run all night, all week, all month, unattended. That means that the percentage efficiency goes down, of course, but the actual number of hours used per month rises!

Eight thousand total terminal-hours are used monthly and the total monthly cost to operate may be under $40,000 – a break-even figure of under $5 per hour.

From the user's viewpoint, paying $5 per hour to run a Basic program on a minisystem usually means he pays for the service of being provided the Basic interpreter only.

Using a $20 per hour big system forces that same Basic user to help pay for a good deal more overhead than which he can use practically. Yet Basic is the same, and so is the quality of performance.

The minicomputer time-sharing system concedes that it cannot be all things to all people. It can only be "equivalent" in perhaps a few aspects of the large system capability.

There is a place in the world for both where each can make its best contribution.

Walter C. Friedrich is the Chairman of the Board of Community Computer Corp., a manufacturer of special peripheral equipment. His firm manufactures an interface that permits the attachment of the IBM 2311 or compatible disk drive with the Hewlett-Packard 2000-series minicomputers.

Sometimes Manufacturers Don't Guess Right

By Tod Morcott
Special to Computerworld

When Control Data Corp. (CDC) discontinued efforts to make the CDC 3800 and Summit a workable time-sharing system, many of the original group who worked on the 3800 did not agree with the company's decision.

They felt that the 3800 was a viable system, with a little more work, better software, and a product plan.

This group recognized that a need existed for a system with:

- Large-scale hardware to permit many resources for user access.
- The software must be available immediately, to permit effective development.
- High-speed large-volume I/O coupled with large data bases.
- Simple expansion of the system's capabilities.

Working Softwares

Early in 1968, the group decided to tackle the remaining development work on the 3800, as a separate company.

The system had a basic skeleton of working software. The software supported both multiprocessing and multiprogramming. The hardware was very fast, and could be expanded easily. High speed large-capacity mass storage was available, and interfaces had already been developed.

In November, 1968 Interaccess began. November and December were spent in defining system strengths and weaknesses. System shortcomings were few, fortunately:

- Various small, but annoying system bugs had to be resolved.
- The Fortran compiler was compiling too slowly–it needed to be streamlined.
- Software interfaces needed optimization.

System additions were delineated:

A time-sharing vendors history of development.

- A conversational text editor was needed.
- A Basic compiler was a must.
- A remote job entry processor had to be developed.
- Communications interfaces' had to be added.

Development tasks were broken into three categories:

- New 3800 software.
- Communications software and equipment.
- Modification of existing systems software.

The new software and modifications were already defined.

The communications interfaces were the next task.

Communications

The CDC 1700 process controller was selected as the communications buffer. The Varian 620i was to be the remote multiplexor.

The 1700 had a basic operating system, but it didn't have a communications subsystem. It had to be designed and implemented.

The Varian 620i was a good minicomputer to use as the multiplexor. However, there might be a better way to use it. The group designed extensions and additions to the 620i and had them built to order.

The communications interfaces were now working. The underlying concept was that each system component should handle those functions that it was best equipped to do. The 3800 would handle processing and file manipulation. The 1700 would take care of communications buffering and "this line" editing. The 620i would feed the 1700. A project of this size and complexity needed special tools to assure sucess. The company had them or developed them:

- Each technical staff member had an average of four years experience on the 3800 and Summit
- Measurement and monitoring of the system was critical to the test and integration phases. A comprehensive monitoring subroutine was built into the operating system.

Problems along the way:

- Blocking and deblocking of files was done in the operating system. Each time this function was needed, valuable system time was required to issue and service the interrupt. The logical file handling was removed from the operating system and put in user-level subroutines thereby increasing system throughout.
- Various functional areas of the existing operating system contained redundant code and processes. They were resolved.
- The loader was given a higher system priority to speed up the loading of user programs.
- Paging was significantly improved by modifying the paging supervisor and developing a new paging algorithm.

Substantial improvements were also made to other software:

- The text editor, based on the University of California design, was restructured to add uniformity to the syntax for record addressing–direct, indirect, and range addressing.
- The Fortran compiler originally used a general purpose assembler in its second pass. The assembler was scrapped and a new one was developed without affecting the efficiency of the object code.
- The Basic compiler was extended into a Superbasic language with the addition of powerful new options. It maintained its compatibility with the Basic language. Subroutine call facilities were added to allow inclusion of Superbasic or Fortran subroutines.

The measuring techniques developed as a result of implementation necessity are still in use today. They allow sales and performance reports to be in the hands of technicians and salesmen early the following morning. System probes for areas of performance improvement can be accomplished with minimum effort. The prior day's results are produced using an on-line plotter. The system categories of performance are monitored continously and are depicted on a scale of minutes for:

- Number of users on-line.
- Number of conversational time-sharing pages in use
- Number of batch drum pages in use.
- Percent of time in background.
- Percent of compute time used.
- Page swap rate.
- Percent of channel time used.
- Percent of core page time used.

Other areas of measurement include time and frequency and

(Continued to Page 23)

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G. Sales/Marketing
H. Other ________

COMPANY BUSINESS:

1. Mining or Construction
2. Manufacturer/Computer or Data System
3. Manufacturer/Other
4. Utility
5. Wholesale/Retail
6. Finance
7. Consultants/DP Services
8. Business Service (except DP)
9. Educational/Medical/Legal
10. Government/Military
11. Other ________

Corporate Planning: GE's Plan for Working With T/S

By Peter Carr
CW Staff Writer

Economists claim that the future of business enterprise is shaped by economic forecasting and decision-making. In the past 20 years computers have become an indispensable part of this decision-making process.

The uncertainty of the future demands that economists and decision-makers use tools capable of handling the myriad of details that will influence their decisions. Most business decisions are, in effect, chains of decisions. Each decision may influence subsequent events and potential decisions.

The building of forecasting models was a slow task at best, especially in large diversified organizations such as GE.

Often it would require several months to prepare the data to build a model. Several design revisions and many data changes would usually mean that, before the model could be completed, the need for it would be long past. The executive cannot wait for a model, when the decision must be made next week.

Several approaches exist for creating a business evaluation. GE has experimented with many of these decision-making models for many years in the corporate planning department.

Modeling Techniques

Decision Tree models are familiar to every financial planner. These are graphic representations showing alternative paths of action. For each single event, a 'yes' or 'no' decision is made. Depending on which branch is taken, the model shows what the results will be.

The Decision Tree has major drawbacks. It is only useful for a limited number of uncertainties three at the most. With only two possible decisions for a single event, 'yes' or 'no'–a 15-year analysis requires over a billion branches, for a large company like GE.

The concept of Risk Analysis is used to minimize the number of branches on the decision tree. By estimating the distribution of events over the year to be computed, the model estimates the outcome for each strategy. But the sample is so large numerically that a computer is the only practical computing device.

Systems design, programming, keypunching, and computer operations, and model building add a large time element to the project. Thus the decision-maker himself became a puppet of his staff.

Done Before It Started

Project workers frequently found that the decision had already been taken weeks before their model was completed. Many questions and problems remained about capital investment decisions even after using well-developed procedures – including a computer model.

The time-sharing system has changed all this. Time-sharing allows rapid computation from a combination of operations research, general economic models, decision theory, and the GE accounting system.

Results which are meaningful to the decision maker, such as return on investment, cash flow, market share, and net income, are available in minutes.

With time-sharing, the user converses with the computer, and is able not only to modify his assumptions, but also check the model as he goes along.

The GE Plant Appropriation Request Simulation (Parsim) programs are designed to aid the decision-maker compute the implication of his intuition and estimates of future events, without the need to interpose model builders, programmers and card punches.

Time-sharing gives the decision-maker at GE the opportunity to immerse himself directly in the decision situation with a minimum of buffer layers.

Through a combination of Risk Analysis and certain elements of the Decision Tree theory, the model permits an investigation of alternative strategies, degrees of uncertainty, risk, reward, and permits the introduction of limited conditional decision-making.

Although the model does not optimize each subsequent decision, it offers considerable advantage over the usual "single--valued" calculations. Single--valued decisions to not permit conditional analysis.

It also makes assumptions explicit and tests the sensitivity of the results of these assumptions. It is easy to modify either alternatives or estimates after seeing the output immediately.

The GE time-shared model permits the examination of a number of criteria: net profit, total investment, residual income, market position, return on investment, and first cost. It also includes the expected distribution or range, of these results for each alternative.

By exploring problems and analyzing the results of alternative strategies, the decision-maker can reach a solution within minutes, with the aid of time-sharing.

Time-Sharing Can Be a Company Tool or Toy

By Peter L. Briggs
CW Supplement Editor

Time-sharing is rapidly becoming both the latest tool and the newest toy for ordinary business data processing. Time-sharing has already penetrated the more sophisticated applications such as forecasting and market planning, but its effect on accounting and inventory-type processing is still minor.

Time-sharing offers rapid response, low overhead, multiple languages, specialized application packages, and minimal investment in programmers and data processing staff.

New time-sharing companies are beginning to offer services that are geared directly to smaller businesses with what have traditionally been batch-oriented applications. Such applications as accounts receivable, general ledger, simple inventory processing, payroll, and many others are now considered serious candidates for time-sharing systems.

What Are The Basic Requirements?

Systems that support such services must offer certain capabilities:

- Inexpensive terminals.
- Cheap data storage.
- Rapid access to large files.
- English or procedure-oriented languages.
- Packaged applications.
- Low prices for connect as opposed to CPU time.

Major Manufacturers' Attitudes

Most of the major computer mainframe manufacturers are fighting this trend towards on-line time-shared systems. Time-shared computers do not sell as well as batch-oriented computers, because fewer are needed. More efficient use can be made of a system when many users are sharing its resources simultaneously.

The manufacturers are pushing the advantages of batch, particularly the high-speed processing, unlimited data storage, security, and reliability.

The time-sharing companies are pushing the advantages of time-sharing: rapid turnaround, simple installation, no equipment overhead, and scope of specialized applications.

Both Sides Right and Wrong

There are certainly accurate claims from both sides.

Before a user can really evaluate whether or not a particular application is suited for time-sharing he must answer some basic questions. These questions are almost the same as those that must be answered when considering any on-line application.

- Does a time-shared system provide either lower real costs, or some equally valuable equivalent such as rapid turnaround?
- Can the company cope with the required changes in personnel, education, company reorganization, work schedules, and working methods?
- Can the company plan for such a system adequately to prevent catastrophes?
- Is the existing file of data that will start the system working sufficiently accurate to be reliable?
- If the data must be cleaned up, can the company find the necessary data to make the corrections?
- Is the data well-enough documented to permit recovery in case of a diaster?

In the uproar over time-sharing and on-line systems, many users may overlook the seriousness of these questions. The answers to these questions are, more often than not, NO!

Are Costs Lower?

Generally, the cost for doing work on a remote system of any type is higher than the cost for such work in a batch-oriented system. These costs are different from the costs involved in conventional systems, and are sometimes not apparent.

True, redundancy can be significantly reduced. This is particularly true of clerical applications. Data is only entered once, rather than several times. Data need only be processed the same way once, provided adequate data management systems exist.

More time must be spent verifying the accuracy of inputs to the system. There is little or no opportunity to check such entered data, as there is in a conventional system with all its cross checks.

System reliability becomes much more critical, when a company ceases operation because its time-sharing service is down.

Time-sharing offers a type of "sex-appeal". Putting an accounting system "on-line" is sort of a "today" idea. But, this kind of appeal cannot be weighed against dollars, for most businesses.

How Do Companies Decide?

Many companies get into a time-shared, on-line, immediate response system because the people who must design and build such systems would much prefer to "play" with more complicated toys.

It is much more fun to design and debug an interactive system than to build another payroll system for the 360/30.

None of these causes has anything to do with whether or not the particular application for a particular company really ought to be time-shared.

Any on-line system, whether time-shared or not, involves drastic changes in the way a company does business. New methods of getting data together must be developed. New quality control must be instituted. Many times the entire staff must be retrained in a new way of working.

Backup procedures must be instituted to prevent serious difficulties in case of computer breakdown. This frequently is not done because the cost of the backup procedures often exceeds the cost of the time-shared system. In fact, the backup costs are often identical to the original cost of doing everything by hand, or on a batch computer.

Data Reliability

Often, a company will get well into a conversion to time-shared system and discover that the results are not right. After much hair-pulling and many discussions, the reason may be the original source data.

Clerks are very useful people. They learn the idiosyncrasies of a company's bookkeeping well enough to compensate for consistent errors.

A bookkeeper will always remember to change the due date on a particular client's bill, even though it has never been changed on the books. A time-sharing system and the relevant programs cannot compensate for such vagaries. Computers are absolutely literal. Once the decisions about billing cycles are turned over to the computer, the bills are issued automatically.

To protect against undesirable effects, many companies have instituted a review system, where an accountant examines each bill, to make sure all the little inconsistencies are handled properly.

Conversion to a totally on-line system will often result in much higher costs than had been estimated. This comes from a 'natural law'. "It costs 90% of the money to do 10% of the work." Frequently, companies would be well-advised to put only that portion of a system on-line that can be converted easily. It is cheaper to let the rest stay batch or even manual.

CDC's Mistake Makes New T/S Opportunity

(Continued from Page 21)

distribution of functional system elements: compilers, executive, monitor, editor, etc.

These measurement statistics allowed Interaccess to improve system performance to the extent of reducing prices in January. Reductions of from 10% to 50% have been realized.

The future of the system calls for expansion to a dual-processor mode when saturation level is approached. Mass memory will be expanded when its current 300-million character capacity is exceeded. Additional 1700s and 620is will be installed as a function of volume use and geographical coverage.

One of the most exciting features of the hardware is its "Perform Algorithm" instruction (firmware) which allows a direct CPU interface to a group of instructions in one instruction cycle. Taking advantage of this hardware, CDC built a polynomial evaluator to be interfaced to the CPU. This firmware subroutine can be called upon by the use of one instruction rather than use of a subroutine. The ratio of improvement is 5:1.

The future use of this capability could be tremendous. With the cost of semiconductor memories dropping so rapidly, we may see major comiler functions built into a hardware device; maybe even entire compilers.

There are no real reasons why most of these functions, like compilers, executives, data management, etc. cannot be placed within the hardware. The only current limitation is the additional cost for special memories. Either holographic or semiconductor, these memories will be available soon.

Dr. Morcott was one of the original members of the CDC 3800 Summit development group. He later formed a new company, Interaccess, which has developed the system into a workable commercial time-sharing system based in California.


SIGMA
7
SERVICE

Can Serve as Network Concentrator

Datanet-500 Offers Users Communications Flexibility

SCHENECTADY, N.Y. – Datanet-500, a communications processing system from GE, is said to be capable of transferring 1.2 million char/sec while executing 200K instruction/sec and controlling 100 full-duplex low-speed lines.

Designed specifically for online data communications, the system can serve up to 250 low speed or 125 voice grade lines at the same time and can accommodate 500 to 1,500 users, GE said.

Dr. Thomas A. Vanderslice, deputy division general manager of Information Systems Programs, Phoenix, Ariz., said the communications system "permits more efffective use of telephone lines and other common carrier facilties, and greatly increases reliability of data communications functions."

The Datanet-500 can be teamed with most computers and terminal devices on the market, including Touch-Tone phones, according to GE. It is designed to serve as a communication network processor, including remote line concentration. As a line concentrator, Datanet-500 would serve many low-speed terminals in a particular area while reducing to one or two the long-distance phone lines required for connection to a central computer.

As a network processor, the new system would perform a number of functions including message switching, data collection and distribution, GE said.

Four subsystems – memory, processor, communications, and input-output modules – make up the complete system. The system can process messages originating with most terminal devices and can exchange data with any communications-oriented information system anywhere, GE said.

Significant design advancements claimed by GE include automatic error control and online diagnostic capability. These are said to enable the system to detect potential malfunctions before they occur, reducing repair time and maintaining system reliability.

Memory Subsystem

Core memory units are available in 8,192, 16,384, and 32,768 words. Two such units of the same size may be configured, for a maximum memory size of 65,536 words. Word length is 20 bits: 18 data bits plus one odd parity bit for each 9-bit half-word character. Each half word is individually addressable with a special instruction set.

Memory cycle time is 1.2 microseconds, which includes 200 nanoseconds of logic delay time. Processor and input/output multiplexers may be connected to as many as four memory interfaces.

Processor Subsystem

The Datanet-500 processor provides control of system functions, including execution of instructions, communications channel servicing, intiation and termination of peripheral input/output transfers, and monitoring the status of critical system modules through use of a unique error storage unit.

Three program-accessible accumulator/index registers are provided, and four levels of hardware interrupt. Precision of system timing is said to be enhanced by a program-controlled real-time register.

A repertoire of 100 communications-oriented instructions are provided, including a set of channel-servicing macro-commands, character-addressing instructions, and optional multiply and divide commands.

Basic instruction times are: Transfer, 1.2 μsec; Load or Store, 1.2 μsec; Load/Alter/Store, 1.8 μsec; Add or Subtract, 2.4 μsec; Multiply (18 bits by 18 bits), 20 μsec maximum; and Divide (18 bits by 18 bits), 25 μsec maximum.

A 256-word Read Only Memory bootstrap feature is said to assure rapid restart and recovery in the event of system malfunction.

Communications Subsystem

Datanet 500 communications modules provide interfaces for all available classes of communications channels: low-speed asynchronous, 30-300 bit/sec; medium-speed asynchronous, up to 2,000 bit/sec; medium-speed synchronous, up to 10,800 bit/sec, and low-to-medium-speed parallel channels for dial-out purposes or for input from such devices as Touch-Tone phones.

As many as 250 low-speed asynchronous, or 125 medium-speed half- or full-duplex channels may be serviced by the system, with bit rates and code levels program-selectable on individual channels.

Sampling by the Datanet-500 of each received bit 64 times during the specified bit time is said to minimize the effect of information distortion caused by communications lines problems.

A program-controlled "loop-back" feature in the Datanet-500 system expedites isolation and diagnosis of communications channels problems.

Broadband communications channels at speeds up to 2.5-million bits per second, and peripheral input/output devices, including high-performance magnetic disks and tapes, may be interfaced with the Datanet-500 through direct-connection channels or through multiplexer modules.

Depending on the system configuration, either two or three multiplexer modules may be served, with each controlling up to four peripheral subsystems or eight broadband channels.

Monthly rental for the Datanet-500 ranges from $1,500 to $20,000 depending on size of application. Sale prices run from $50,000 upward. Delivery is expected in the fourth quarter of this year.

New CRT Terminal Produces Hard Copies

MOUNTAIN VIEW, Calif. – An electrophotographic silverless process for producing hard copy in less than seven seconds is incorporated into a CRT terminal offered by Photophysics Data Systems.

Called the Photophysics 45 data terminal, the unit uses inert white paper rather than an active metalized paper. The electrophotographic process has been made possible by the development of a large-area photoconductor with an ASA speed of 30, allowing an exposure time under 1/4 second, according to the company.

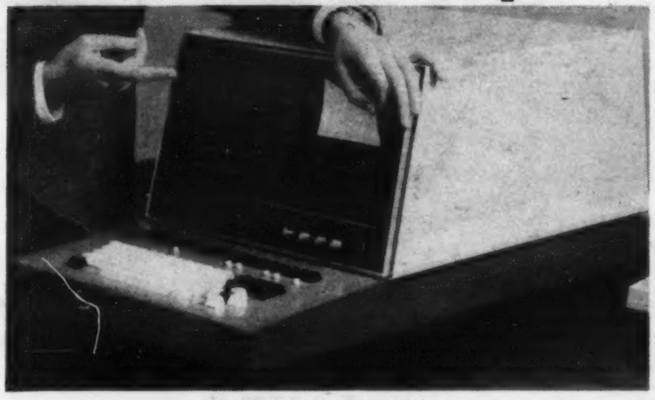
The copy is not light-sensitive, does not fade, and can accept pen or pencil notes, the company says. The paper is supplied on rolls capable of 1,200 printouts without reloading. Paper will be priced at less than one cent per copy, the company says.

The 45 data terminal can display up to 1,000 data characters in 25 lines of 40 characters each, and can also display bar charts and graphs generated by a computer or operator.

The data display unit generates hard-copy characters of approximately 10-point size. The keyboard provides 48 data keys and 30 control keys with editing features such as full cursor address control, full format/blink control, insert and delete functions, character repeat, double space, and frame roll. Character generation and memory functions utilize integral MOS circuitry.

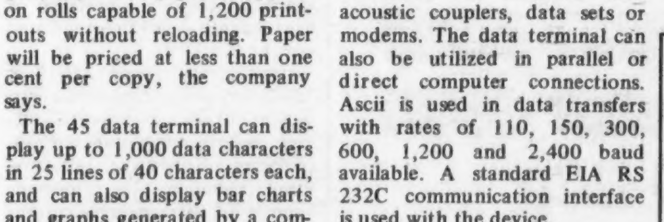
Additional copies may be produced in less than two seconds after the first direct copy, according to the company.

Compatible with most CRT or teletypewriter terminals, the 45 terminal can interface with acoustic couplers, data sets or modems. The data terminal can also be utilized in parallel or direct computer connections. Ascii is used in data transfers with rates of 110, 150, 300, 600, 1,200 and 2,400 baud available. A standard EIA RS 232C communication interface is used with the device.


45 CRT Data Terminal

The 45 data terminal with hard copy costs $9,950. First deliveries will be made in October, according to a company spokesman. The product may also be leased.

Photophysics Data Systems is located at 1255 Terra Bella Ave.



Actual Size of Hard Copy From 45 Terminal

T/S Graphic Display System for Minis

PALO ALTO, Calif. – A time-shared graphic display system for minicomputers which can show over 4,000 characters with 85 char/row is available from Data Disc Inc.

Over 1/4-million points are shown per display. Each Model 6512 terminal in a system can display a different picture showing both graphics and alphanumerics on its 512 by 512 points screen, the company says.

Each display reportedly has its own dedicated refresh memory equivalent to 32K bytes of storage, which is included in the price. Once a display image is stored in the refresh memory, the computer needs to work only when additions or deletions are required, the company says.

A built-in, 64-character, alphanumeric generator and a graphic generator are features of the equipment. The graphic generator is said to simplify programming for plotting bar graphs, histograms and annotated graphs, and continuous or discontinuous functions.

TV monitors, color TV sets, or Data Disk monitors with a separate keyboard can be used to provide displays.

The price per channel of graphic display, including terminal, is $2,500. The keyboard and monitor cost $1,500. A 90-day warranty is included. Service contracts are available, according to a company spokesman.

Interfaces to allow the display system to be used with all Hewlett-Packard, and models 316 and 516 Honeywell minis, can be supplied by Data Disc for $3,000. Interfaces for other 16-bit computers will be built to order, the company said.

Data Disc is located at 1275 California Ave.


6512 Display Terminal

Controller Enables Off-Line Use of IBM 1403 Printer

By Frank Piasta
CW Staff Writer

EL SEGUNDO, Calif. – A controller from Dataflo Business Machines Corp. will allow System 360 peripherals to be used for off-line high-speed printing, the company reported.

Able to interface any Model 2400 tape drive and any of the 1403 series of printers, the Dataflo-I is said to provide all buffering and control functions necessary, without tying up normal on-line operation of the central processing unit, main memory or associated controllers. An optional switch allows the 360 peripherals to be returned to 360 control.

According to Ray Lorenz, vice-president of engineering for Dataflo, "We feel that we will play a large part in unburdening the processor from printing chores, and put the computer back to work computing."

The Dataflo controller is said by the manufacturer to be simple to operate, and personnel can be trained quickly at minimal expense. In addition, it can be put into service quickly, Dataflo says.

In most cases, it is claimed, installation of the Dataflo unit as well as operator training can be accomplished in one day. Site preparation and installation are accomplished with a minimum of disruption of normal operating procedures, according to the company.

The basic Dataflo-I system has a 1,024-byte buffer, of which 767 bytes are usable for tape blocking. It has the capability to control either 7- or 9-track 800 bit/in. NRZI magnetic tape drives.

The printer is said to operate at its maximum speed, with three different printer chains available. Both the AN and HN alphanumeric 48-character chains can be accommodated, as can the SN upper and lower case, 84-character chain.

No software is required for the controller as all of the programming is hardwired into the controller. The tape records must be formatted so that the first character of each logical record is a format character for the controller. Space 1, 2, or 3 lines; go to channels 1 through 12; or space before or after printing may be specified. Each tape record contains one print line. Padding of records is not necessary as variable length records can be accommodated.

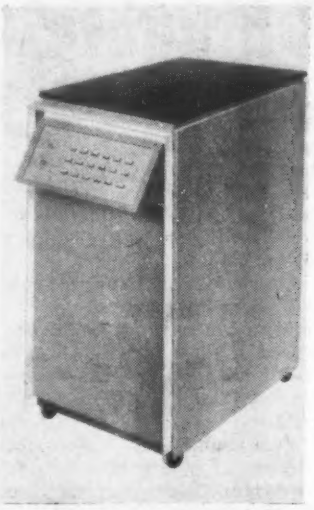
Among options available for the Dataflo-I are a 4,096-byte buffer and the ability to control a 1,600 bit/in. tape drive. The 1,600-bit option precludes the use of 7-track drives.

Another option allows tabulating across the print line, with up to six tab stops possible. A file-search forward and reverse option can bypass files on tape while searching for files to be printed.

The basic Dataflo-I sells for $37,000, and rents for $940/mo. Maintenance costs would amount to $50/mo.

Rental prices for some of the options include: 4,096-byte buffer, $110/mo; horizontal tab, $50/mo; 1,600-bit/in. option, $115/mo; and on-line switch, $45/mo.

The company is at 714 S. Douglas St.



Dataflo-I Controller

Device Interfaces 16-Bit Computers TO Disk Drives

PHILADELPHIA – A hardware device designed to interface small computers with mass storage units is available from Community Computer Corp.

Designated the Model 1010 disk controller, the device provides up to 51-million bytes of mass storage capability for a 16-bit computer. Two 16-bit processors may access up to eight disk drives through the use of the Model 1010, the company said.

The device is a self-contained plug-in package, designed around computers with DMA (direct memory access) and the IBM 2311 disk drive. The controller could be tailored to interface most other 16-bit, word-length processors with IBM 2311-compatible disk storage units, according to the company.

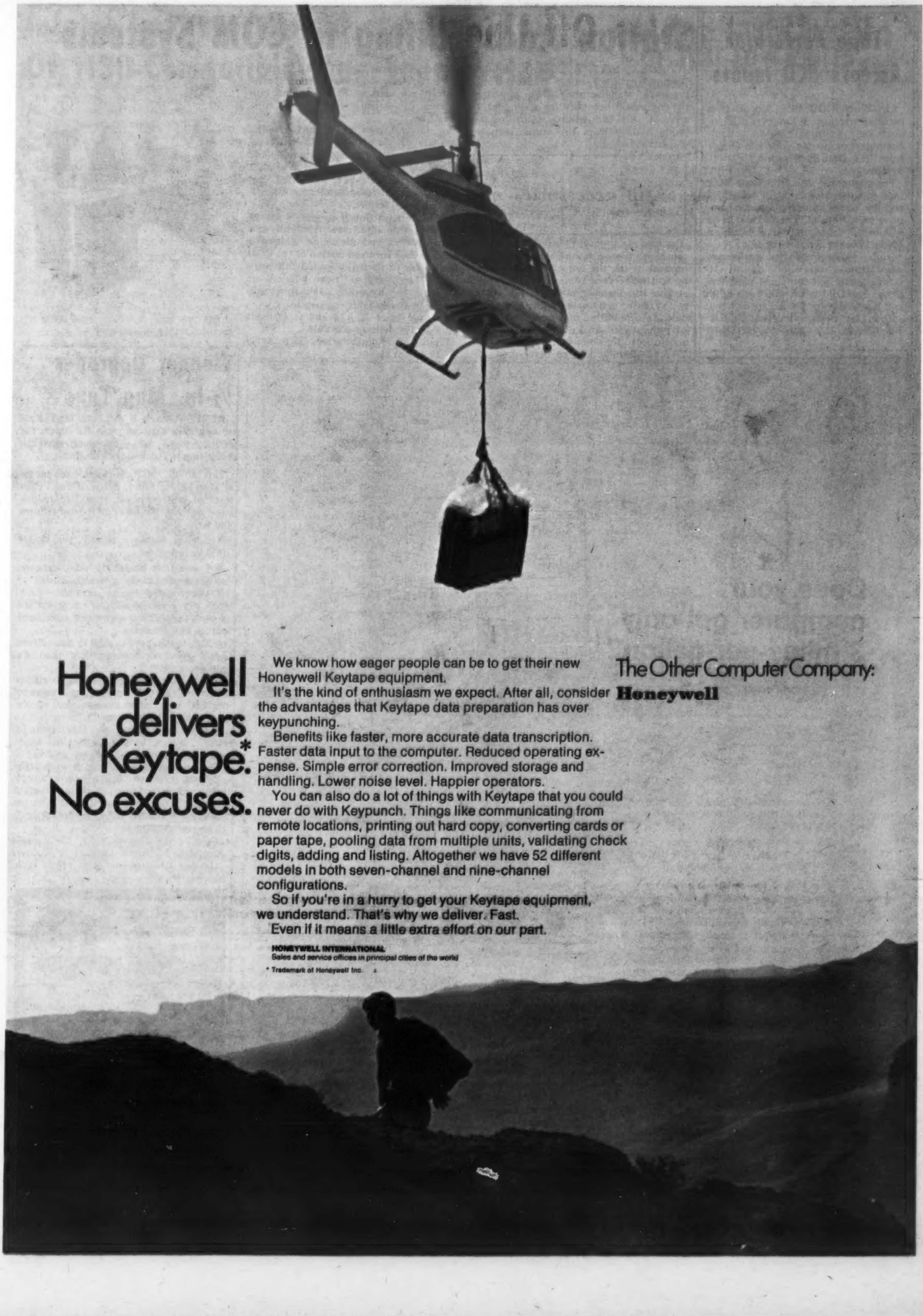
The company said it had successfully implemented the 1010 with the 2311 on its own Hewlett-Packard 2000A time-sharing systems thereby achieving a high-capacity on-line random storage capability.

Transfer rate of the 1010 is 156K byte/sec. The device can handle 43,000 addressable sectors. Interface is almost entirely through hardware, allowing more memory and processor time to be used for applications programs. The 1010 uses a set of 10 instructions between the processor and the 2311, according to a company spokesman.

Data transfer is through a 16-bit cyclic check-code word appended to each data block. The unit contains its own power supply.

The 1010 disk controller costs $21,500, including software to allow the controller to operate with the HP 2000A time-sharing system. Disk diagnostic routines are also available, and a disk operating system reportedly is under development that will be supplied to users when ready. Delivery schedule is 90 days.

Community Computer Corp. is at 185 W. Schoolhouse Lane.



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The Other Computer Company:
Honeywell

Tape Perforator Accepts BCD Inputs

LINCOLNWOOD, Ill. – A paper tape perforator accepting low-level BCD inputs and recording data in a comcomputer-compatible code is available from Pivan Data Systems Inc.
Systems Inc.

The perforator, the Dijitpunch 400, uses integrated circuits for reliability and low power consumption, the company says. Reliability is also said to be enhanced because the mechanism moves only when punching tape.

Other features of the device are asynchronous operation up to 10 char/sec, and self-contained tape handling. The Dijitpunch 400 costs $895 and is available for immediate delivery.

Pivan Data Systems Inc. is at 6955 N. Hamlin Ave.

Station Adds Editing to COM Systems

CORONA, N.Y. – A COM (Computer Output Microfilm) station available from Prestoseal Manufacturing Corp. provides the equipment necessary for adding leaders and tails and editing microfilm to produce documents for either reel or magazine loading.

dp accessories

Designated Comsole, the Model 629 provides a double rewind station for film reversal having the capacity for handling up to 1,600 feet of 16mm film. The work station also includes a Model 100.1 butt splicer (fused end-to-end) allowing for the deletion or addition of a desired number of frames with an invisible butt splice, according to the company.

Where cartridge loading is required, an additional splicer Model 2510.1 allows the intermixing of acetate and polyester material as used with leaders and tails utilized for cartridge loading, the company says.

An integral part of Comsole is the magnetic drive cartridge loader with regulated torque that has instant braking and controlled winding for high-speed production. Both splicers have a viewing light with a lucite diffused surface for examining individual frames.

An optional 5 power magnifier has an eye-correction adjustment reportedly free from parallax and distortion. This magnifier is used for examination of the COM film prior to its being loaded into cartridges. Motorized cartridge winders are available for Recordak, 3M, Burroughs Bcom, or Datagraphix equipment.

Comsole costs $2,474 and is available on a 30-day delivery schedule.

Prestoseal Manufacturing Corp. is at 37-12 108th St.

Comsole 629

Cleaner Upgrades ½-In. Mag Tape

RESTON, Va. – A magnetic tape cleaner upgrades tape to raise the operating efficiency of data processing systems, according to General Kinetics Inc.

The Model 7000 advanced blade cleaner, for 1/2-in. tapes, designed for a high level of error removal, is said to reduce time and expense lost due to read failures and write skips.

According to the company, the Model 7000 includes:

- Convertible blade: optional, circular, self-sharpening blade or straight blades.
- Automatic tissue advance: automatically presents a clean tissue surface to each tape, thereby ensuring consistent quality and economy.
- Operating speed of 150 in./sec: cleans 2,400 feet of tape in less than six minutes.
- Precision guiding: precision guides with bearings and nonrotating flanges to prevent tape edge damage and ensure proper tape guiding.
- Fail-safe braking: in the event of power failure, brakes are applied automatically, insuring against tape spilling.

The cleaner also makes a round-trip cleaning cycle and checks both the beginning and end-of-tape markers. Program and file tapes may be cleaned without affecting recorded data, according to a company spokesman.

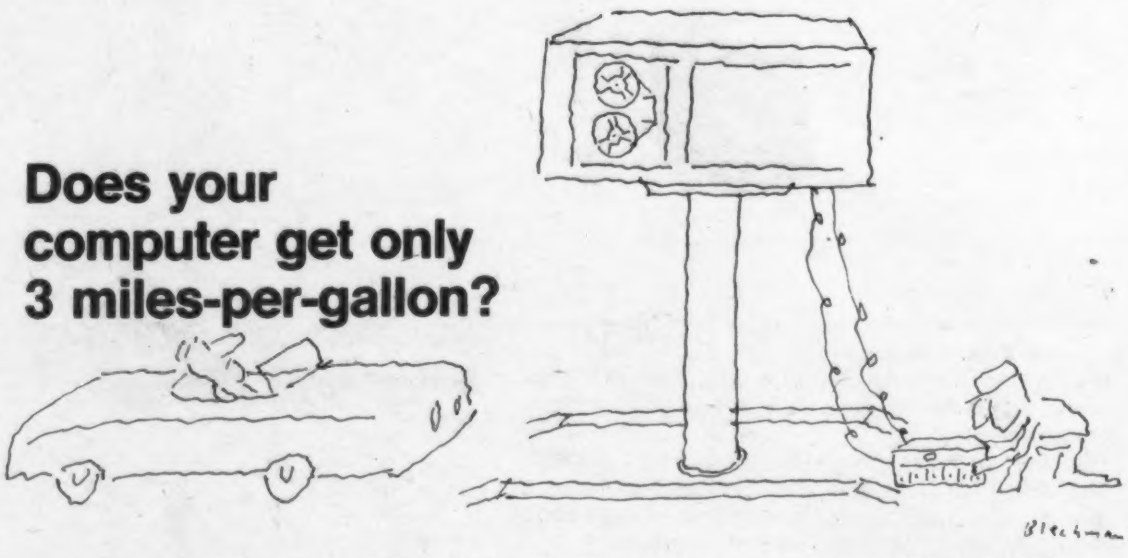
Cost of the cleaner is $2,195. Rentals start at $137.50/mo. Delivery is 30 days.

General Kinetics Inc. is at 11425 Isaac Newton Square South.

7000 Blade Cleaner

Paper Tape Stacker

A paper tape receiver and dispenser that accommodates 500 ft of fanfold paper tape in each of three pockets sells for $30. Typagraph Corp., 7525 Convoy Court, San Diego, Calif., is offering the product.



Infotec Increases Speed and Data Rate Of 1130-Compatible Mag Tape System

PLAINVIEW, N.Y. – Infotec Inc. has increased the capabilities of its magnetic tape system, Model TS-1130C, for use with the IBM 1130.

The system consists of a controller, one to four tape handlers, and a software package for updating the disk monitor system. The tape speed of the TS-1130C has been increased from 25 to 37-1/2 in./sec.

The system reads and writes on 1/2-in. magnetic tape, with a data rate of 30,000 char/sec, which was previously 20,000 char/sec. Reel size is 10-1/2 in. System tape handlers can be either 7- or 9-track and can be intermixed within an individual system. Tape format is IBM compatible, the company said.

The system features a read-after-write head, a separate erase head, and hardware for the calculation of LRC (longitudinal redundancy check) and CRC (cyclic redundancy check). Individual LRC and CRC registers, which can be accessed for correcting flawed records, are provided, according to the company.

The TS-1130C uses cycle steal and direct memory access (SAC). Cycle steal reportedly allows a tape function to be initiated in just one memory cycle.

The operating subroutines provided with the TS-1130C can be accessed by using read/write statements in Fortran or call statements in 1130 Assembly Language. The subroutines are assembled to reflect the number and type of tape handlers (7- or 9-track) provided with the system, the company said.

Infotec provides software and field service support. A 90-day warranty for parts and labor is included.

The price ranges from $12,227 with one tape handler to $30,220 with four, the company said. The TS-1130C is also available on a rental basis.

Infotec Inc. is at 70 Newtown Road.

Digitizer Converts Full-Size Patterns

E. HARTFORD, Conn. – A large area coordinate digitizer for conversion of full-sized patterns, markers, or stencils into digital data for use in computer-controlled operations is available from Gerber Garment Technology Inc.

The Model 70-D digitizer may be used as part of Gerber's numerically controlled cloth-cutting system or wherever graphical information must be converted to digital information, according to the company.

The digitizer has a flat working area of 6 ft by 20 ft. Accuracy reportedly is within 1/32 in. for the entire area and within 1/64 in. for a selected smaller area, the company said.

The unit uses a vacuum hold-down feature for securing markers to the table surface and a powered table positioning system allowing operators to adjust the table height continuously so that work is done at eye level.

Features of the digitizer include a simplified keyboard, reading head eye-piece, and an auxiliary pen in the reading head.

A feature of the system is said to allow the operator to digitize rapidly by positioning the reading head over sharp corners, positions of notches, and points along the straight and curved edges of the pattern's pieces.

This minimal data is automatically converted to delineation of pattern shapes when processed to make magnetic or punched paper tapes for operating the Gerber cloth-cutting system.

The output of the digitizer is converted to punched cards. An alphanumeric keyboard also allows inputs of code numbers, size notations, and special cutting instructions to the same cards during the process.

The Model 70-D digitizer costs $29,990. Delivery is four months. A standard guarantee for parts and labor is included. The company said that leasing arrangements are available.

Gerber Garment Technology Inc. is at 87 Charles St.

Computer May Pick Jury

BOSTON – In the near future, jurors chosen in Boston may have only a computer to blame.

William Tanner, senior systems analyst in Boston's Data Processing Division, told a City Council committee that his department is studying several plans for jury selection by computer.

Miles and Miles and Miles

NEW YORK – The New York Stock Exchange says that 80 miles of figures was the amount of computer print-outs that went into its massive statistical study of brokerage commission schedules.

COMPUTERWORLD

societies

Harvard MBAs Seek Opportunities With Small Business Management

BOSTON – This June, Harvard's business school will award its prestigious MBA degrees to an increasing number of men interested in applying their data processing interest and experience in small businesses.

The school's Small Business Opportunities, International (SBOI) is a 200-member, student-initiated program aimed at locating job opportunities in small- and medium-size businesses throughout the world. The group hopes that its efforts will benefit both SBOI members and firms too small, too localized, or too tightly budgeted for mass recruiting campaigns.

According to Albert R. Tetrault, an SBOI area chairman, "Some of our members have experience in EDP with users and manufacturers of computer systems."

Target Firms

A "small business," the organization says, is not judged by sales or the number of employees, but by the size of the management team. Ideally, this team would be small and would work closely with each member responsible for a functional area or multifunctional profit center and participating in the overall operation of the company.

The graduates' salary objectives are varied. SBOI says it is expected that compensation offered would depend on the specific job opportunity and the individual candidate. Some members are willing to consider future equity participation as part of the compensation package.

For interested firms, SBOI will, without charge, distribute a job description to MBA candidates interested in small business; provide resumes of interested men who may fill the job specifications; and, upon request, distribute job descriptions to similar organizations at other graduate business schools.

The organization is endorsed, but not adminstered, by the school's placement office and is at the business school on Soldiers Field Road, 02163.

New Ansi Publication Encourages Public Surveillance on Standards

NEW YORK – A new bulletin designed to solicit public comment on new standards, those submitted for approval, or revised American National Standards is being published by the American National Standards Institute (Ansi).

Entitled "Standards Action," the bulletin will be issued every two weeks to insure widespread consideration of pending action, including the reaffirmation or withdrawal of standards. Notice will also be taken of recently completed standards actions.

According to an Ansi spokesman, "Standards Action" will be available at no cost to interested industrial firms; trade, technical, and professional organizations; consumer and labor groups; government agencies; the trade and technical press; and concerned individuals. Issues will include the title and description of each standard on which action is proposed; the time limit for comment; and the name and address of the organization from which a copy of the standard may be obtained.

Comments received will be submitted to the institute's board of standards review, which is responsible for final approval, reaffirmation, or withdrawal actions.

Ansi is the national clearinghouse for voluntary standardization in the U.S. It approves a standard when evidence is received that those concerned with the application have had an opportunity to cooperate in its development and that there is substantial agreement on its provisions. The agency also represents the U.S. in various international standardization projects.

Ansi is at 1430 Broadway, 10018.

Call for Papers

1970 IEEE SYMPOSIUM, Dec. 7-9 Austin, Texas.

Papers are solicited on various aspects of adaptive processes, decision, and control such as pattern recognition detection, automata theory, system identification, mathematical models for adaptive and learning systems, applications of adaptive and learning processes to control problems, power systems control, adaptive communications, forecasting and control of economic time series, air traffic control, remote sensing of earth's resources, and biomedical and geological data processing.

Two types of papers are being solicited: detailed papers describing completed work, and short papers relating recent and preliminary work.

Authors are asked to submit five copies of complete manuscript for regular papers or five copies of a 700-word summary for short papers. Deadlines for submission are May 1 for regular papers and August 1 for short papers.

Address correspondence to Prof. D.G. Lainiotis, program chairman, IEEE 1970 Symposium on Adaptive Processes, Building 502, University of Texas at Austin, Austin, Texas 78712.

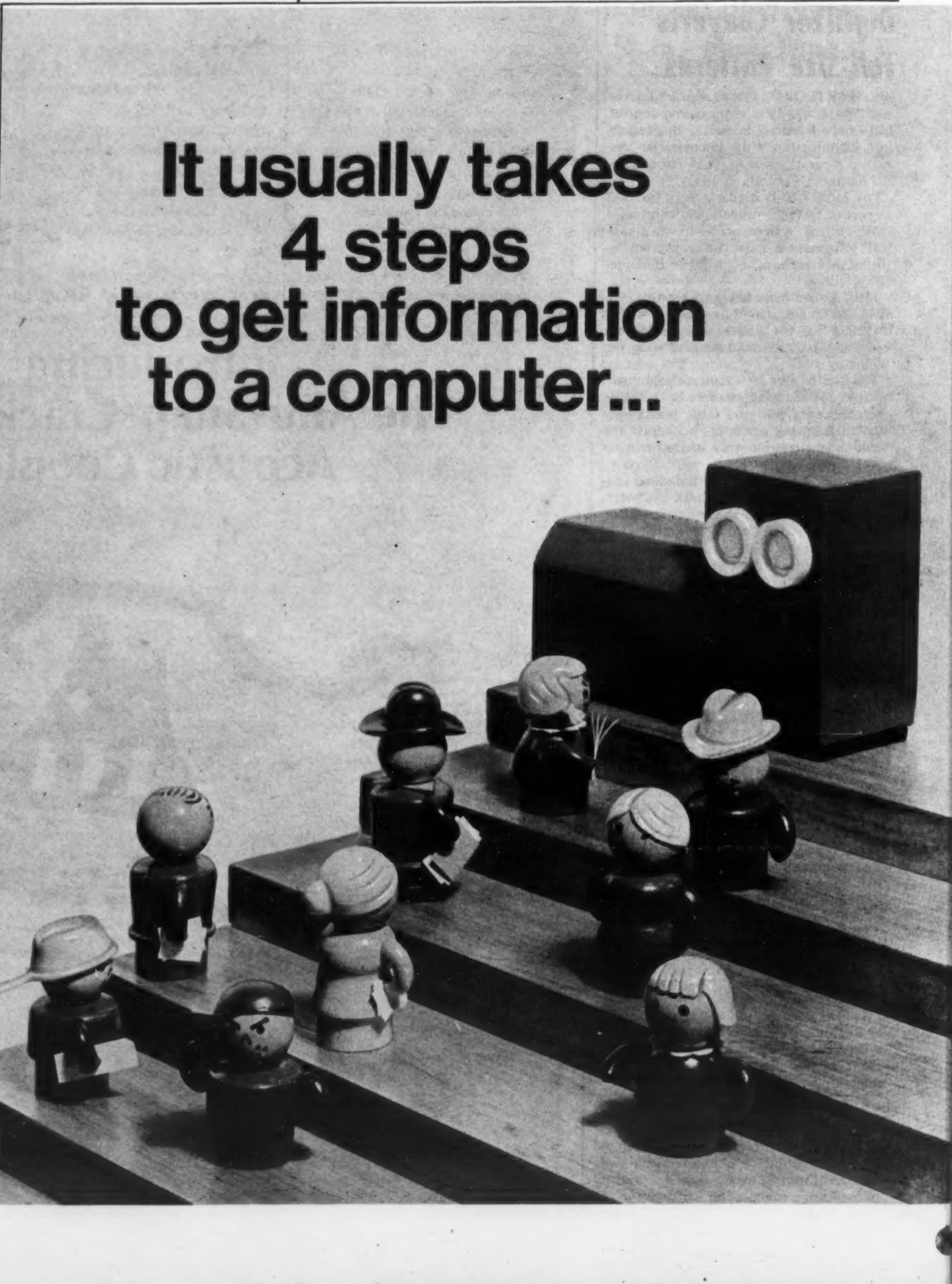
1970 ANNUAL CONVENTION OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, Oct. 11-15, Philadelphia, Pa.

This year's annual convention will emphasize the unsatisfied needs for information of various segments of our society.

Subjects suggested for this theme are: What are information scientists doing to meet the information needs of contemporary society? What are the information problems of a changing world? What are the conflicting public issues and trends in solving society's information problems? Can information practitioners apply what information theoreticians preach? Have information scientists adequately exploited well-established methodologies from other disciplines? What are the ethical and moral issues raised by the "information revolution?"

The deadlines are as follows: April 1 for intent to submit, May 17 completed manuscript is due, and July 1 notification of acceptance.

Contact: Dr. E. Garfield, Institute for Scientific Information, 325 Chestnut St., Philadelphia, Pa. 19106 for information.



Penn State, Southern Methodist University Initiate DP Degrees

UNIVERSITY PARK, Pa. – A new two-year degree program in computer science will be offered this fall by the Pennsylvania State University at six of its Commonwealth campuses.

Development of the program stemmed from a special university task force report two years ago, recommending that EDP facilities gradually be installed at most of the school's 19 campuses. Under the program, equipment at each of the selected locations will be linked by telephone lines to the university's IBM 360/67 here.

In addition to the program's focus on data processing education, the equipment will also be used in related fields, such as business, accounting, retail operations, and engineering. The Beaver, Fayette, New Kensington, Schuylkill, Scranton, and York campuses have been selected for project participation.

A second new program, granting a Bachelor of Applied Science degree for studies in computer science, has been instituted at Southern Methodist University in Dallas.

According to Dr. Thomas L. Martin Jr., dean of the SMU Institute of Technology, "This program offers an unusual opportunity for entering college students with career interests in industry and business – specifically computer technology."

The program features a strong mathematics base of 31 semester hours.

The school's computer science faculty now numbers 12, and its computing facilities house four digital systems: a Univac 1108, a Digital Equipment Corp. PDP-10, a Honeywell 1250, and a CDC 1604. An EAI-690 hybrid system is also available.

COMPUTERWORLD education

Diebold Cites Potential of CAI As Critical Tool for Industry

NEW YORK – A study conducted by the Diebold Research Program has singled out computer-assisted instruction (CAI) as a technique with great potential for providing individualized instruction to industry.

Citing cost, speed, and personnel factors, the report indicates that by the mid-1970s, such instruction will be of increased value because of these identifiable industry trends:

- A typical member of the nation's work force changes jobs twelve times in his life.
- Eighty percent of the working force makes a major change of occupation at least once.
- Those with a high school education or less have become increasingly marginal to the economy.
- Everyone, even the marginally trained employee, has raised his expectations.

Industry is finding that as skill requirements are raised, employees are changing jobs so frequently that they do not remain long enough to master these skills.

Therefore, the report concludes that "the rate of technological displacement is increasing, and, as a result, corporations must retain more and more of their older employees. At the same time, many new employees will be young adults and members of disadvantaged minority groups. These people need special training if they are to be productive employees."

It also emphasizes that as a result of the tight labor market, additional demands are being placed on computer-assisted instruction. The study views CAI as one area which offers hope for dealing with problems of varied learning rates and capabilities.

Three educational functions (curriculum preparation and modification, presentation of the curriculum to students, and statistical analysis of each student's performance) are cited for CAI applications, and the study recommends five steps for successful implementation of the individualized techniques.

- Assigning a corporate evaluation and development team that takes a sample CAI lesson itself.
- Obtaining or developing a suitable programmer language, followed by development of an initial lesson to be conducted with computer assistance.
- Administering, during the test period, of the lessons developed to two groups of employees – the evaluation team and employees who would normally be taking the subject matter in standard training courses.
- Evaluating the benefits and disadvantages of CAI for the installation, based on experience gained during the test period.
- If warranted, undertaking development of a full-scale training procedure, integrating CAI with traditional techniques.

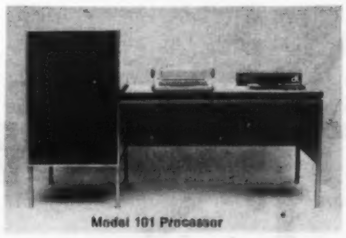
Bowdoin Expands EDP Ability With PDP-10

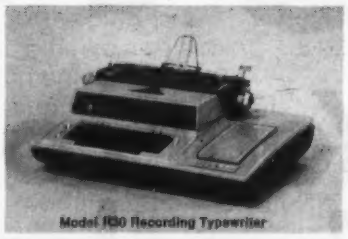
BRUNSWICK, Maine – Bowdoin College has installed a new Digital Equipment Corp. PDP-10 general-purpose system to handle many of the school's administrative, research, and instructional needs.

Upon completion, the system will be able to accommodate 63 users, but Bowdoin Computing Center Director Myron W. Curtis noted that only five terminals are now operational on the Bowdoin campus.

By next fall, several area colleges and secondary schools are expected to add terminals to the system.

Bowdin also will retain its affiliation with Dartmouth College's vast time-sharing network.





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Afips Announces Robert W. Rector As New Treasurer

MONTVALE, N.J. – The American Federation of Information Processing Societies (Afips) has announced the election of Dr. Robert W. Rector as treasurer of the society.

In making the announcement, Afips President Dr. Richard I. Tanaka said that Rector, elected by the Afips board of directors, will serve the unexpired term left vacant by the recent death of Dr. Walter Hoffman.

As chief financial officer of the federation, Rector will be responsible, along with the executive committee, for the fiscal policy and planning, as well as overall direction of Afips financial activities.

Robert W. Rector

Rector is vice-president of corporate relations for Informatics, Inc., Sherman Oaks, Calif. In addition to membership in several leading mathematical and scientific organizations, he has served on both the Afips executive committee and board of directors and was general chairman of the 1965 Fall Joint Computer Conference.

He received his Ph.D. in mathematics from the University of Maryland.

IEEE - IEE Collaboration by Yields New Tape Services

NEW YORK – Machine-readable magnetic tapes containing indexing and abstracts of papers in the fields of electronics, computers and control, and applied physics will soon be available on a monthly basis through a new service of the Institute of Electrical and Electronics Engineers (IEEE).

Called the IEEE Retrieval from the Literature on Electronics and Computer Sciences (Reflecs), the materials will be delivered to initial subscribers in April by IEEE's information services.

According to IEEE, the tapes will be produced in a variety of character codes and tape formats, and customers will also be able to select their areas of interest from eight broad subject categories, including computer science and technology.

Under an agreement with England's Institution of Electrical Engineers (IEE), numerous journals, conferences, patents, and books will be surveyed to produce total coverage of an estimated 66,000 scientific and technical papers this year.

A second tape service, the IEEE Annual Index Tapes, will also be delivered in 1970. This yearly service will contain cumulative indexing of IEEE's own publications for the years 1968 and 1969, totaling about 16,000, according to the organization.

And love, as we all know, requires understanding. More and more companies are learning that a commitment to management information systems is of little value without an equal commitment to computer training and education.

First, neither your hardware or your software can be any more effective than the people who make it work. And even if those people had previous training and job experience when you hired them, how current is that knowledge in the face of a rapidly changing technology?

Courses and special seminars at EDP schools may be part of the answer. But more and more good EDP managers recognize that something more is needed: a system and a set of tools that permits people to learn at their own individual pace, at their place of employment, on a one-to-one ratio.

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Edutronics Systems International, Inc., 3345 Wilshire Blvd., Los Angeles, Calif. 90005. (213) 380-7811. Sales offices in New York, Chicago and other principal cities.

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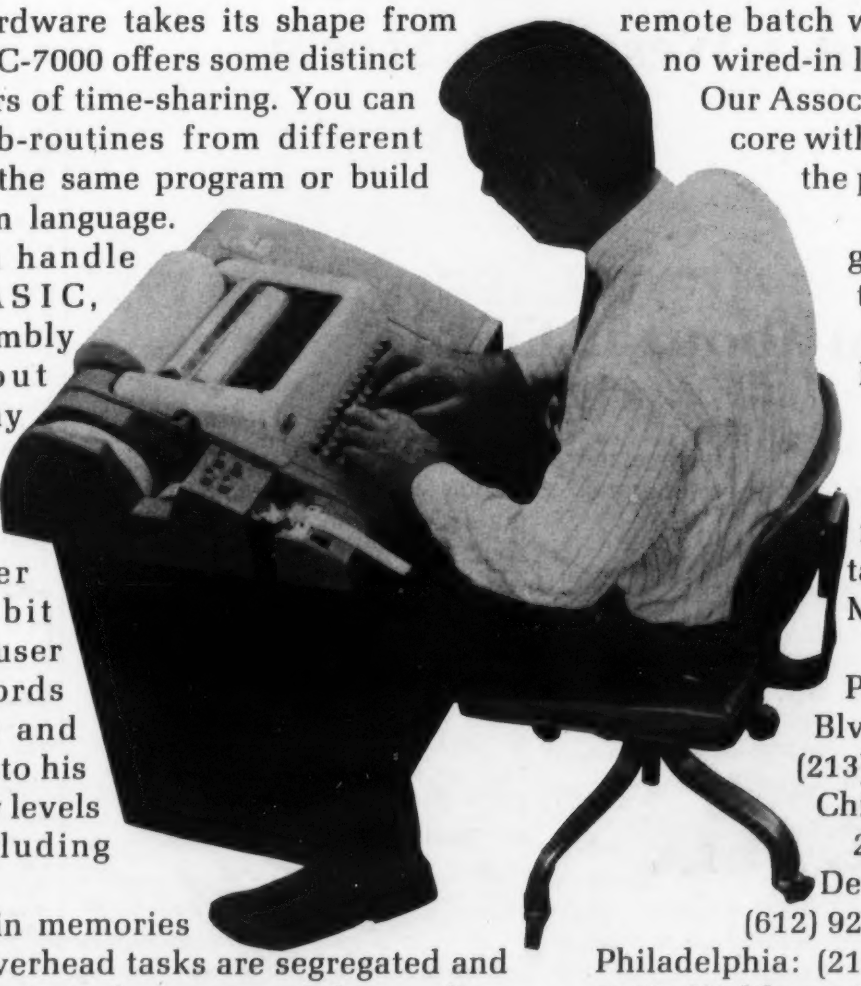

Because the hardware takes its shape from the software, the IC-7000 offers some distinct advantages to users of time-sharing. You can mix or match sub-routines from different languages within the same program or build your own program language. The IC-7000 can handle FORTRAN, BASIC, COBOL and assembly language without degradation in any dialect.

It's a powerful, new fourth generation computer with a 256K-36 bit word core. Each user has up to 64K words available in core and can control access to his files at any security levels he programs including "inviolate."

Control and main memories are separate. All overhead tasks are segregated and handled in an economical manner while number-crunching tasks are slammed through tremendously fast, optimized areas. And the IC-7000 can handle remote batch within the same framework, with no wired-in limitations in any mode.

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There has never been a time like this. For detailed information and full pricing/leasing schedules, contact Bill Otterson, Vice President of Marketing or any of our sales offices. STANDARD COMPUTER CORPORATION, 1411 West Olympic Blvd., Los Angeles, California 90015 (213) 387-5267.

Chicago: (312) 726-0277; Dallas: (214) 239-9627; Denver: (303) 428-0529; Detroit: (313) 352-1710; Minneapolis: (612) 926-0706; New York: (212) 661-1834; Philadelphia: (215) 563-6350; San Jose: (408) 294-7150; Waltham: (617) 891-5083.

All software for the IC-7000 was developed in conjunction with Call-A-Computer, Inc.

Standard Computer

Quadraplegic serviceman John Wolthusen receiving programming instruction from IBM's Michael Moss at St. Alban's Naval Hospital. Twenty participants graduated in April as part of a pilot program directed by the 52 Association.

War Vets Trained for Programming Jobs

By Anne Nolan
CW Staff Writer

NEW YORK – An increasing number of servicemen wounded in Vietnam are receiving an opportunity to move into the computer programming field upon discharge from the service.

The men, currently undergoing treatment at St. Alban's Naval Hospital, Queens, N.Y., and the Philadelphia Naval Hospital, have been enrolled in classes organized by the 52 Association with the cooperation of the Department of Defense. The association is a nonprofit philanthropy dedicated to serving the needs of the nation's disabled servicemen.

A Friend at the Chase

The initial program was offered at St. Alban's and soon gained sponsorship by the Chase Manhattan Bank. Of about 300 applicants, nearly 50 passed an aptitude test and enrolled in the course. Of these, 20 completed the classes and received diplomas last April. Commenting on the careful screening of applicants, a project leader noted: "We do not want to play games with a wounded vet's future."

More than three cycles, each lasting about four months, have been held thus far, with the 52 Association receiving increasing assistance from the bank. Another course is scheduled to begin this spring.

To date, Chase Manhattan has hired eight graduates of the programming course, employing them in its systems design division.

According to William W. Shine, Chase vice-president, all of the men hired are doing "an excellent job, are very eager to learn, and have an interest in the bank."

'Something to Work With'

One of the veterans now at Chase, Martin R. Johnson, is very pleased with the program. "It was a big break for me," he said. "I had originally gone into the service to find some skill to use on the outside. After about four years, I really hadn't found myself, and then I got the opportunity to take this course. It gave me a skill and has given me something to work with."

Another pilot programmer course, this one sponsored by the Provident National Bank, was also offered at the Philadelphia Naval Hospital. A second class was slated to begin this month.

Richard Lindner, bank vice-president, estimated that of about 15 selected participants, five completed the course. Employment has been secured for these graduates. Lindner noted that a fair percentage of students is lost because of transfers, discharges, or scheduled surgery.

According to a 52 Association spokesman, the organization plans to initiate similar courses at the Valley Forge Army Hospital near Philadelphia and at the Walter Reed Army Hospital in Washington, D.C., in the near future.

Expansion Encouraged

Noting that there are now more amputees from Vietnam than from both the Korean conflict and World War II combined, 52 Association President Clayton E. Wheat Jr. said, "There should be a center of this type in every region of the country."

The association is presently establishing a $2.5 million Advanced Technology and Computer Training Center at its 41-acre recreation and rehabilitation complex in Ossining, N.Y., with capital funds committees being formed among the nation's industrialists, business firms, and foundations.

A booklet describing the group endeavors, "Training Our Nation's War Wounded," is available from 52 Association headquarters at 147 E. 50th St., 10022.

Calendar

March 31-April 3, Bermuda – The Computer Command and Control Co. presents "Third Generation Management Seminars." Also on April 14-17 in Hawaii and April 27-30 in Chicago. Contact: The Education Institute, Computer Command & Control Co., Suite 1305, 1717 Pennsylvania Ave., N.W., Washington, D.C. 20006.

April 1-3, New York – Computer Systems Management, Inc. presents a course on "Third Generation Computer Management & Administration," also on April 22-24 in Chicago. Contact: Registrar, Computer Systems Management, Inc., Seminar Division, Jefferson Bldg., Suite 405, 901 N. Washington St., Alexandria, Va. 22314.

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LOS ANGELES (Mike Malone) 213-380-5264	**NEW YORK** (Don Mills) 212-239-8227	**PHILADELPHIA** (Bob Brown) 215-265-0890	**SAN FRANCISCO** (Don Johnston) 408-247-1929
WASHINGTON, D.C. * (Nat Aucott) 703-525-5612	**LONDON, ENGLAND** (Tim Wickes) 01-398-6959	**MONTREAL** (Al Thompson) 514-866-8506	**TORONTO** (Stan Thompson) 416-366-7643

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New Literature

Illustrated technical literature is available on EECO 1651 computer I/O typewriters from Electronic Engineering Co. of Calif. The four-page Advance Data publication includes general information, technical specifications, photographs of working units, and keyboard layouts. For further information contact Electronic Engineering Co. of Calif., 1601 E. Chestnut Ave., Santa Ana, Calif. 92702.

An eight-page illustrated brochure detailing General Automation's programming services and software products is now available. Titled *"Applications Programming,"* the brochure covers the technological services provided to the industrial automation market through GA's automation sciences division. Write to General Automation, Inc., automation sciences division, 706 W. Katella Ave., Orange, Calif. 92667.

Walton Laboratories has re- 12-page brochure on certifititled *"Humidification for Industry,"* which explains how to correct specific troublesome situations caused by lack of a controlled environment. The brochure also gives general guidelines for the humidification rates needed by sample industries. Copies are available at Walton Industries, division of Melnor Industries, 1 Carol Place, Moonachie, N.J. 07074.

A four-page brochure from GE describes the new GE inventory management system that sets inventory policies, computes economic lot size, adjusts order quantities, calculates order start and due dates, and generates useful data for manufacturing companies. Copies may be obtained by writing GE Information Systems, Bldg. 6-207, Schenectady, N.Y. 12305.

Computer Systems Technology, Inc. has recently issued a 12-page brochure on certificate of deposit accounting system, which is a profit-oriented banking tool that provides the bank money manager with a method of evaluating and controlling certificate of deposit inventory as it relates to the current money market. For a copy or more information on the system, contact Comstec, Fox Pavilion, Jenkentown, Pa. 19046.

A brochure entitled *"Free Access Weberfloor in Modern Architecture"* describing the concept of access (or raised) flooring, has been released by Weber Architectural Products, Walter Kidde & Co., Inc. The 12-page booklet explains why many advantages have been overlooked, except in special purpose applications such as computer rooms, where the need for special flooring is unquestioned. Contact Weber Architectural Products, 1340 Monroe Ave., N.W., Grand Rapids, Mich. 49502.

A six-page bulletin has been published by Computer Products of Ft. Lauderdale, Fla., describing the 40 models in the DA-035 series digital-to-analog converters, as well as all of the mechanical and electronic information necessary for a potential customer to place an order. For information contact Laurence K. Buck, Marketing Manager, Computer Products, 2709 N. Dixie Highway, P.O. Box 23849, Ft. Lauderdale, Fla. 33307.

A special businesswide study, "Management and the Computer," has been prepared by *The Wall Street Journal.* The report, which is concerned with corporate management's use of electronic data processing, is available from Ralph B. Walter, Market Research Dept., The Wall Street Journal, 30 Broad Street, New York, N.Y. 10004.

The CMC Model 9 keyprocessing system from Computer Machinery Corp. is described in a six-page color brochure. For information write Ruth Wishner, Public Relations, Computer Machinery Corp., 2000 Stoner Ave., Los Angeles, Calif. 90255.

Information bulletin #170 illustrates the new portable data terminal manufactured by Technitrend, Inc. The bulletin illustrates some of its uses, gives full product description, and outlines operation procedures for the data terminal. Copies are available from Louis Swinand, Director of Marketing, Technitrend Inc., 7300 Crescent Blvd., Pennsauken, N.J. 08110.

A 12-page brochure has recently been published describing the 25B data transmission system from Lenkurt Electric Co., Inc., a subsidiary of General Telephone & Electronics Corp. The pamphlet includes a description of the basic equipment, application sheets for typical uses of the system, engineering data, and performance information. For a copy write Dept. A134; Lenkurt Electric Co., 1105 County Road, San Carlos, Calif. 94070.

Beta Instrument Corp. has issued a brochure entitled, "Beta Customer Reference Manual, Beta Com 600," which describes a stored program computer output microfilmer capable of printing high-resolution alphanumerics and graphics. Contact: Beta Instrument Corp., 20 Ossipee Road, Newton Upper Falls, Mass. 02164.

Sigma 3, Xerox Data Systems' new low-cost multiuse computer, is described in a 20-page pamphlet. The brochure describes the computer's various compilers, assemblers, and operating systems and is available from XDS Sales Promotion, 701 S. Aviation Blvd., El Segundo, Calif. 90245.

GE has issued a four-page two-color brochure that describes the new GE inventory management system (GEims). The pamphlet explains how GEims automatically assigns and adjusts product levels, builds and maintains a bill of material file, automatically adjusts to engineering changes, and provides a variety of data. Write: GE Information Systems, Bldg. 6-207, Schenectady, N.Y. 12305.

Sanders Cuts 7% of Workers, Commercial EDP Up 50%

By Harvey Elman
CW Staff Writer

NASHUA, N.H. – Employment increases in the commercial EDP division of Sanders Associates Inc. – more than 50% in the past six months – have not entirely compensated for decreases in military programs, forcing the company to cut almost 7% of the work force, according to company President Royden C. Sanders, Jr.

Sanders said the overall reduction, which was initiated during the previous fiscal year, is expected to involve approximately 658 of the company's 9,400 employees in facilities in five states.

Commercial Expansions

"Employment in the commercial divisions is expected to continue to increase through both transfers of employees and new hiring. Our commercial business continues to expand into new markets, with a corporate booking objective of over $40 million for fiscal 1970 compared to $24 million last year," he added.

"The reductions in divisions involved in military programs primarily are due to stretchouts of military programs and delays in funding new military programs, the inevitable consequence of adjusting to a changing military environment while expanding into the rapidly growing commercial data communications fields."

Sanders forecasts these commercial markets to exceed $14 billion by 1978.

Guise Reviews T /S Users' Buying Habits; Utilities to Shoulder Burden by 1980

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES – "A small piece of a big computer is better than a big piece of a small computer. That's what time-sharing is all about," said Robert F. Guise, Jr., president of Com-Share, an Ann Arbor, Mich. time-sharing firm, at a recent meeting here.

"It's inevitable that within the next 10 years, 70% of the computer load will be on utilities. Once everyone had his own cesspool, then he hooked up to sewers. People had their own wells, then they hooked up to water company service. Computer usage will go the same way," he said.

Reviewing the buying habits of time-sharing users, Guise noted that 50% of their business is repetitive-users with more than one terminal. "The telephone company no longer sells a first telephone," he said.

"They take it for granted that you have one. They're now selling you a phone for the bedroom, kitchen, and Princess or color phones. That's what we're starting to do. Most of our customers are large corporations who already have extensive computing facilities. They put in one terminal that works out and they get more."

According to an industry study, GE had 40% of the time-sharing business in 1968, IBM had 17%, four firms including Com-Share shared 25%, and about 50 firms divided the rest.

Last year, according to Com-Share's estimate, GE had 35% of the business, IBM had 20%, six top firms shared 25%, and the remainder was split among 70 firms.

Moment of Truth

Guise views this year as the "moment of truth" for time-sharing companies, with news of office closings and mergers becoming commonplace. As the head of one of the top three independent companies in the business, he listed four requirements as essential for a time-share firm to survive.

- Research and development software capability is primary. We offer programming languages, applications languages, and direct applications. Our business is 75% in the area of "do-it-yourself kit" languages which enable skilled people to develop their own programs. Twenty five per cent is in the "ready-made suit" category, users utilizing our own applications. I expect to see the present usage ratio change over the next few years to become 60% using applications and 40% using languages.

The impetus is all for broadening the base of those using the systems. Recent failures are in large part due to the companies' failure to invest in R&D, but instead to attempt to survive on just the manufacturer's software.

- You've got to have a strong marketing force. Most companies are headed by engineers who think that if they build a better mousetrap, the world will beat a path to their door. This just isn't true and is another major cause of failure.

- In today's environment, you must have a nationwide distribution capability. Time-share has not yet proven to be the panacea for the small businessman. As most of our customers are large corporations, it is essential to have the same capability available for all their offices.

- A reliable service is a must. We are the first company to take on maintenance of all our equipment. We use more than one manufacturer's hardware and we've found that the only way to keep the standards of a time-share service is to provide our own. You just can't have a bunch of users off the air. Even the telephone companies aren't geared to time-share requirements. We've learned their equipment so that by the time the serviceman arrives, we can tell him where the trouble is.

The economics of today's time-share industry are not trivial. According to Guise, an income of $600,000/mo. is needed to achieve profitability and to keep all necessary elements moving. Formed in January, 1967, Com-Share expects to become profitable this spring. Its cost breakdown is 10% for R&D, 25% for computers, 20% for communications, 10% for administrative executive control, and 35% for marketing.

Communications System Is First Devonshire Product

NEWTON, Mass. – A special-purpose system designed for preprocessing, concentration, data direction, message switching, and remote terminal operations, will be the first product to be marketed by Devonshire Computer Corp.

"The system is unique since it is the first built especially for data communications applications," according to Kenneth E. Curewitz, Devonshire president. "It will handle communications networks more efficiently than general-purpose computers currently being adapted to these applications," he said.

Sixty percent of installed computers presently involve a communications requirement, a company estimate said. Devonshire expects communications processing to be the fastest growing segment of the computer industry, doubling each year through 1973.

"We plan to ship our first system in May," said Curewitz, "and to have 40 systems installed by the end of this year." Company sales are expected to exceed $2 million in 1970.

Curewitz said the system will handle a variety of communications tasks, including the following:

- As a preprocessor, the system will handle many remote terminals of various types simultaneously, freeing the central processor for other tasks.
- Operating as a concentrator, the system will compress data from remote terminals and feed it over high-speed lines to a central processor.
- In on-line data direction, the system collects and distributes information to and from a central computer. Off-line, the system will feed other types of equipment such as line printers and storage media.
- It can also be used as a message switching system to tie together a network of terminals and computers.

Curewitz said the company plans to begin national marketing in April to multi-division companies, time-sharing services, systems houses, and terminal and computer manufacturers.

Technitrol Buys Honeywell Memory Test Business

PHILADELPHIA – Technitrol, Inc. has purchased from Honeywell, Inc. the memory test equipment business, including manufacturing assets and patent rights, for $500,000.

Technitrol, which manufactures computer components, systems and related equipment, said its entry into the memory test equipment business is "a natural extension" of existing capabilities.

President E. Stuart Eichert noted that Technitrol's pulse transformer customers are primarily manufacturers of core memories, and that memory test equipment is widely used by these same firms in testing completed core memories as well as their component parts.

The Technitrol official pointed out that the computer industry currently produces more than 20 billion memory cores every year, each of which must be tested individually.

Eichert said that Technitrol will continue the lines purchased from Honeywell, including manufacturing replacement parts, and plans to develop new generations of memory test equipment.

Technitrol also reported that audited 1969 results showed record sales of $13,180,439, up 48% from the $8,895,736 reported in 1968. Net income for the year totaled $556,585, equal to 40 cents a share. In 1968, the company had a loss amounting to $127,293.

Spiegel Catalog Utilizes Univac 418-III, Expedites Packaging, Billing Data Flow

CHICAGO – Spiegel Inc., one of the country's largest catalog sales organizations, has contracted for a Sperry Rand Univac 418-III real-time computer system valued at more than $600,000 to expedite the company's business operations.

The primary application being designed for the Univac 418-III is designated Feed-back. Under this system, information obtained by a remote optical reader and electronic weight scale device in the packaging station will be relayed to the computer.

The data collected through this process will include item disposition (whether it was shipped, cancelled etc.), weight, and any substitutions and price changes. On receipt of this information, the 418-III reportedly insures the completeness and accuracy of the shipment using order information stored on a Fastrand mass storage unit.

The computer will then store all updated order information on the Fastrand and calculate transportation charges and sales tax. The processing cycle will be completed by the computer transmitting transportation charges or weight and error indicators to the remote device.

Data will be provided for the billing operation on the total order – including such information as sales taxes, and transportation charges; update the billing order holding files, and supply input data for the preparation of packer statistics as well as audit trial reports.

Ultimately, the new system is expected to result in virtual elimination of shipping incomplete or erroneous orders, eliminate manual billing and keypunch operation, provide faster and more complete order statistical reporting and create a computer-controlled billing order holding file.

The complete system supplied to Spiegel will include a central processor with a 32,000-word main memory, a Fastrand II mass storage unit, two magnetic tape units, and a data communications subsystem. A UNIVAC 9300 will be linked on-line to the 418-III.

CDC Closes Melville Laser, Amp Division

MELVILLE, N.Y. – CDC is phasing out its Melville division, which has been involved with government-related laser and perimetric amplifier research and development.

A part of the company's overall cutback, the plant is due to close completely by July 1. Approximately 180 persons were originally employed in the division, according to a company spokesman, including some workers expected to be relocated into consolidated divisions.

Trade Shorts

Rate reductions of 15-20% in data communication services between the U.S. and 16 European countries were announced by ITT World Communications. The new rates cover Telex, privately leased telegraph, and voice/data circuits.

The revised schedule, effective April 1, was made possible, the company said, by economics resulting from the recent establishment of a new, high-capacity trans-Atlantic Mediterranean cable.

The new system will link the U.S. to Spain, Italy, and Portugal, and connect with communications networks in more than 30 other nations in Europe, the Middle East, and Africa.

CDC has agreed to sell all the outstanding stock of Croname-MacDonald Ltd. to Greening Donald Ltd., for an undisclosed amount of cash.

Croname-MacDonald, based in Waterloo, Quebec, was acquired by CDC in 1968 as part of its Commercial Credit Corp. purchase. The company supplies parts to the appliance industry. Greening Donald, with headquarters in Hamilton, Ontario, manufactures wire and metal products.

Kratos-Display Division, Canoga Park, Calif., recently formed by Kratos, Pasadena, to manufacture CRT graphic display systems, has received more than $900,000 in orders for CRT graphic monitors and computer output microfilm drive electronics in its nine months of operation, according to Dick Adams, division general manager.

GE time-sharing has been introduced in Buenos Aires, announced Sergio Chiappori, general manager of Bull-GE in Argentina. The service marks the first offering of GE time-sharing service in South America. The facility in Argentina is the tenth such center opened by GE in the past year.

Comperipherals, Inc., New York City, has announced that its Roneo division has entered into a one-year marketing arrangement to supply Roneotronic electronic scanners to a nationally franchised chain of color copy centers, according to Martin Roth, company vice-president.

The Roneotronic scanners will be used in new ASI action color copy centers, which are now being exclusively franchised nationally by Franchise Marketing Services, in association with American Systems, Inc. One hundred are expected to be opened this year.

Censtat, a newly formed division of Public Data Processing Corp., Chicago, will offer refined demographic statistics from the 1970 census.

Michael D. Maremont, president of PDPC, said: "We can track down future customers and work forces for companies planning relocation, pinpoint marketing programs, or establishing new branches. We can classify by age, income, or several other qualifying factors."

Four Regional Franchises Swell Data Power Network

NEW YORK – Data Power Inc., a Manhattan-based computer services franchise company, has sold four more regional franchises, bringing the total number of owner/operator regional centers to fourteen, according to Arthur L. Leff, company president.

The company, which became public last year, plans a nationwide network of 140 regional centers, 38 in the northeast states alone, site of all current operating centers.

District Program

A district marketing appointee program has also been instituted, whereby each regional center is further divided by the owner/operator into smaller areas for more efficient coverage. The district marketing appointee is chosen by the regional franchise owner/operator, trained by the parent company, and receives as revenues a percentage of the regional owner/operator's income from services.

Data Power, said Leff, expects to have a minimum of 30 services franchises sold within the next six months, serving approximately 1,500 accounts. The services, he said, are oriented toward the estimated 900,000 small business in the U.S. consisting of nine to five hundred employees.

The company's district marketing program is an extended means of reaching this market, he said.

N. Central Airlines Orders Sanders 'Sarts' System

NASHUA, N.H. – North Central Airlines has ordered a Sanders Airline Reservation Terminal System (Sarts) to complement its real-time passenger reservations and communications system, designated Escort, with a network of CRT display terminals that provide split-second access to passenger information stored miles away in a computer.

Under the order, Sanders Associates, Inc., will furnish Sandac 200 communications computers, more than 100 cathode ray tube terminals, and hard copy machines for printing out records of transactions and passenger lists.

The Sanders terminals will be located initially at more than 40 sites. They will be connected via telephone lines to the Sandac system which communicates with North Central's main computer in Minneapolis containing a programmed airline reservations system.

Sarts is designed to provide a three-second response to all inquiries regardless of the location of the display terminals.

Ticket agents and reservations personnel using the display terminals can obtain data on seat availability for a particular flight and alternate flights, applicable fares, scheduled departure and arrival times, and the status of the current day's flight times.

Orders and Installations

General Computing Co. of New York has ordered a $314,000 FR-80 COM unit from Information International of Los Angeles. The FR-80 will be used to plot all the 1,700 stocks on the New York Stock Exchange as well as the stocks on the American Exchange. It will also make animated movies, print such matter as paperback books, telephone directories, catalogs, wind tunnel data, and missile paths.

On behalf of the Department of Public Health of Massachusetts, Systemation, Inc. has installed a Model 102 information retrieval software system from Computer Corp. of America, Cambridge, Mass. The system, which uses IBM 360 equipment, will be used to keep track of statistical and operating data on the state's health care units, including nursing homes, hospitals and laboratories.

SYS Associates, Inc, Hackensack, N.J., has received an order from Chesapeake & Ohio, Baltimore & Ohio Railroad for an SYS 3360 tape conversion system. The off-line system, which converts magnetic tape between a Univac III and an IBM 360, is valued at $100,000.

A Burroughs B3500 system valued at more than $600,000 has been installed at Computer Servicenters, Inc. Applications will include general commercial or customer-designed data processing, order entry, demand inventory and invoicing, and on-line capability in implementing critical path method.

Phi Delta Kappa, a professional education fraternity for men, has ordered a Burroughs B350 valued at $147,000. The B350 will be used to perform membership maintenance, storage, and retrieval of educational documents and research material.

Webster Computer Corp., Danbury, Conn., has received orders for six of its DOS machine utilization reporting systems from Johnson and Johnson of N.J.; Chas. Pfizer and Co.; Pepsi Cola of N.Y.; Kellwood Co. of Miss.; Army Air Force Exchange of Texas; and Maryland Hospital Service.

The Los Alamos Scientific Laboratory (Lasl), N.M., will install a Control Data Corp. 7600 system to expand information processing for its growing number of nuclear research projects. The CDC 7600 will function under Control Data's Scope 70 software operating system, designed to combine the capabilities of the 7600 with those of Lasl's three existing CDC 6600 systems.

International Computers Ltd. of Putney, London, has received several orders for its 1900 series computers. Waller & Hartley Ltd. has installed an ICL 1901A at its head office in Blackpool, Lancashire. Two ICL 1901As will be installed by the Singapore Telephone Board and the Yeo Hiap Seng Canning and Sauce Factory Ltd., of Singapore. A 1902A will be installed for Singapore's Public Utilities Board. 1902A computers have also been ordered by two insurance companies, the Sun Life Assurance Society Ltd., and the Minster Insurance Co., both of London.

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Acquisitions

Hallmark Data Systems, Inc. of Chicago has acquired **Communications Real Time, Inc.**, Elmhurst, Ill. Hallmark specializes in communications, education packages, video tape training programs, and computer services. Communications Real Time serves data processing operations in the areas of communications, operating systems, systems design, and programming.

Coordinated Computer Concepts, Inc., New York, specialist in data processing and collection services for companies in the apparel industry, has acquired **Grotel Adjustments, Ltd.**, New York, a nationwide collections firm operating in the apparel and other trades, for an undisclosed amount of common stock.

Tracor Computing Corp. of Austin, Texas, has acquired **H.J. Gruy and Associates, Inc.** of Dallas. The Gruy companies provide geological, engineering, financial appraising, management, and computing services to the petroleum industry in both domestic and foreign markets.

NCC Leasing, Inc. of Memphis, Tenn., has acquired **Rudin & Roth, Inc.** through the exchange of an undisclosed amount of common stock.

Itel Corp., a San Francisco-based data processing and leasing concern, has agreed to acquire **Intercontinental Systems Inc.** through an exchange of stock. Terms call for Intercontinental shareholders initally to receive 0.2 share of Itel common stock for each Intercontinental share held, with the possibility of up to 0.8 additional Itel shares based on Intercontinental's 1970 earnings.

Contracts

The Information Sciences Division of Computer Applications Inc. of New York has received two contracts from the State of California Department of Education for the development and demonstration of the business and pupil/personnel subsystems of the California education information system. The system includes payroll accounting, inventory reporting, accounts payable, and financial control programs, as well as student scheduling, guidance reporting, attendance accounting, and test scoring.

The Collins Radio Co. of Dallas has received a lease contract from the Mexican government for a Collins C-System. The system will be used to process all motor vehicle registrations and related tax functions.

Brandon/Gaynes Medical Systems, Inc., Dallas, has signed a service agreement with National Health Enterprises, Inc. (NHE) for Auto-Scrobe, the patient billing and accounting system. NHE, a Milwaukee-based corporation with nursing homes in California, Texas, Colorado, and Wisconsin, will utilize the system to allocate charges to Medicare, Medicaid, public welfare and private bills.

Marketing Automation Inc., Moorestown, N.J., has contracted with Credit Systems Inc. to market their Credit-Chek system, a low-cost on-line system designed specifically for credit authorization applications.

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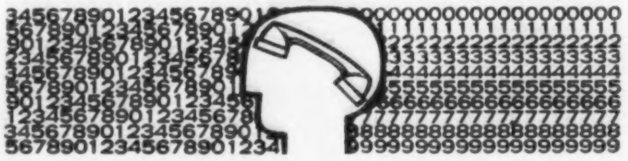

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Expansions

NCR Opens New Baltimore Regional Systems Center

COLUMBIA, Md. – NCR is opening its new Baltimore regional systems center in the new city of Columbia, Md., midway between Washington and Baltimore.

The center will occupy the entire top floor of the American City Building in the city's downtown plaza and will house one of the most recent NCR Century series computers. Offices, conference rooms, an auditorium, library, and six classrooms each designed to accommodate 18 students will be included.

It will provide training for NCR employees and customers in comptuer programming and operation. It will offer customers demonstration facilities, program testing, and assistance both in programming and systems design.

It operates eight other regional systems centers in the country and has its main headquarters in Dayton, Ohio.

Inforex, Inc., Burlington, Mass., a manufacturer of a low-cost computer data entry system, has opened an office at 44 Montgomery St., San Francisco, to provide sales and field service support to customers in the Bay Area.

Problematics, Inc. has moved to a larger facility in W. Concord, Mass. The company is developing a computer-controlled analytical instrument for the chemical industry and expects to have the first production model on the market this summer. Problematics will move to permanent quarters when its 20,000-sq-ft building, now being constructed in Natick, Mass., is completed later this year.

Other Expansions

Applied Logic Corp., Princeton, N.J., has opened a new service center for the New York area at Suite 1699, Two Pennsylvania Plaza, New York. The center will provide local technical support for users of the Al/Com computer time-sharing network.

Data Products Corp., Los Angeles, has opened an office for its Systems Division in Paris. Data Products is a producer of computer peripheral equipment for commercial, industrial, and military applications.

Transdata Corp. has opened a new branch office at 2880 S. Main, Salt Lake City, Utah. Transdata is a Phoenix-based service organization which provides computer services to customers through its Xerox Data Systems Sigma 5 system.

Delta Data Systems of Washington, D.C., has moved its New Jersey branch office to larger quarters. The branch office is located at the Crystalbrook Professional Building, Route 35, Eatontown, N.J.

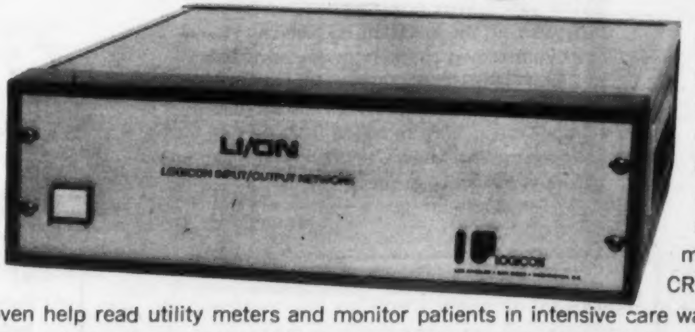
Keane Associates, Inc., a computer systems advisory firm, has opened an office at 7 Cypress St., Warwick, R.I., to serve the Rhode Island area.

Sales facilities for Lockheed Electronics Co. of Los Angeles have been relocated to larger offices in Cupertino Town Center, 10320 Sunnyvale Saratoga Road, Cupertino, Calif.

I/O Systems Division of Sangamo Electric Co. has opened new offices in Springfield, Ill.

Magnetic Head Corp., Hauppauge, N.Y., will move to its new corporate headquarters and plant facility located near the company's present plant in Vanderbilt Industrial Park.

URS Data Sciences Co., San Mateo, Calif., has opened a branch office in Los Angeles.



Operation 'Project 70'

Midland Bank Uses Burroughs B6500 in London Net

Special to Computerworld

LONDON – One of the first Burroughs B6500 computers to arrive in Europe has been delivered to the Midland Bank's Computer Center at Brent in North London. The machine is one of two ordered by the bank; the other will shortly be installed at its North Western Computer Center in Liverpool.

The operation, designated Project 70, utilizes on-line data collection from the branches with overnight processing. Dual B6500 processors will be coupled with a high-speed data transmission link.

The London and Liverpool centers will appear as one overall network while access to information from either center can be obtained by any inquiry from any branch. The equipment at the London center consists of a Burroughs B5500 installed just over a year ago and the recently delivered B6500. The B5500 has been used for program development and trials during the pilot operations of Project 70.

Approximately 240 of the bank's 1,785 full branches and 952 sub-branches throughout the UK will be linked directly to the new $12 million computer complex, reputed to be one of the largest data communications networks in existence. More branches are expected to be added to the system at a rate of 100 per month.

Eventually servicing all the bank's branches,the two centers will be linked by General Post Office land line effectively making them one computer. Linking each branch will be a Burroughs TC500, used in a star multidropped configuration. Eight to 10 terminals are multidropped from a single telephone line and each adjacent branch has its terminal on a different line to its neighbors.

The Midland Bank is ranked third of the 'Big Four' banks in the UK. Its overseas business with over 20,000 outlets, may be the largest of any bank in the world.

Close to five million accounts are held by the bank, of which 800,000 are currently handled by computer.

Discussing the benefit to the customer, Geoffrey Kneale, general manager in charge of administration, cited checks and standing order instructions as two items which probably accounted for 60% to 70% of the activity of an average account. Last year, the bank handled 260 million checks and 5 million instructions.

The computers will handle this enormous volume of routine work more efficiently.

Additional Snags Bind Barclays Bank; Tardy Burroughs B6500 Requires Work

LONDON – Additional problems delayed the final release of a Burroughs B6500 which was delivered approximately three months behind schedule to the Barclays Bank of North London.

Burrougns engineers from the U.S. and UK are now working with the machine to minimize the impact of the delay.

Both Burroughs and Barclays declined to disclose the exact nature of the problem, citing the newness of the machine. According to a Barclays spokesman, the software, though primitive, is not thought to be at fault, and Barclays programmers are already using the computer for development work.

Barclays originally planned to have all bank branches linked to a number of central computers in London, for "D" Day next February when the country officially converts to decimal currency. The delays to the B6500 have resulted in a partial postponement of these plans.

Decimal Currency

Approximately 50% of the bank's branches will be on-line by "D" Day, and the majority of the remainder will be equipped with Burroughs TC500 terminals, which will be used as free-standing units to handle the accounting problems of decimalization.

IBM's A. Watson Ambassador to France

WASHINGTON, D.C. – President Nixon has named Arthur K. Watson, vice chairman of IBM, as U.S. Ambassador to France, the White House said.

Watson is the brother of Thomas J. Watson Jr., chairman and chief executive of IBM, and a son of the company's founder. He will succeed R. Sargent Shriver, who has submitted his resignation.

Arthur Watson is chairman of IBM World Trade Corp., a wholly owned subsidiary based in New York City.

IBM World Trade employs over 15,000 in France where it has two plants manufacturing computers and components.

Executive Corner

Sloan Appointed President of Compute American Corp.

OKLAHOMA CITY, Okla. – Thomas M. Sloan has been appointed president of Compute American Corp. (Comerica), an Oklahoma City-based data processing service firm.

Sloan has been associated directly with the data processing industry since 1959. He graduated from the University of St. Thomas, Houston, Texas, in 1957 with a B.A. degree in economics, and received a masters degree in economics from, Trinity Univeristy, San Antonio, Texas, in 1959.

Sloan has been employed by IBM in Houston, and has worked as a systems analyst and assisted in the installation of unit-record machines and 1401 systems.

In association with Eason Oil Co. in Oklahoma City, Okla., in 1963, Sloan formed EDP, Inc., and served as president and chief operating officer for this data processing service bureau until 1965, when EDP, Inc., merged with University Computing.

In 1965, Sloan was employed with Joshua N. Kahn and Co., CPAs, where, as director of systems and data processing for the El Paso Public Schools in 1967, he was responsible for management of its central computer facility and related punched card installation.

Renola Joins Computer Applications as Div. V.P.

NEW YORK – Raymond Renola has been named a vice-president of the Information Sciences Division of Computer Applications Inc.

In his new position, Renola will direct and coordinate the overall federal marketing operations of the Information Sciences Division. He will make his headquarters at the firm's Washington, D.C. office.

Prior to joining Computer Applications he was vice-president of marketing with Leasco Systems & Research Corp. He has also served as a marketing consultant in the Washington area, and is retired from the U.S. Army after 20 years of service with the rank of colonel.

Renola holds a B.S. in civil and military engineering from the United States Military Academy and an M.B.A. from the Harvard Graduate School of Business Ad-

(Continued on Page 56)

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Reservations Corp. Names W.R. Lonergan President

LOS ANGELES – William R. Lonergan has been named president of International Reservations Corp. Planning Research Corp. owns the world-wide computerized hotel, motel, and auto reservations system.

Lonergan succeeds John N. Graham Jr., who continues as chairman of the board of International Reservations Corp. and resumes his full-time position as vice-president, Computer System Design at Planning Research Corp.

The new president joins the company from RCA where he was vice-president in the Information Systems Division.

Lonergan has 18 years' experience in the design, development, and marketing of computer systems of RCA, Univac, and Burroughs.

Currently, the firm provides reservations service to more than 2,000 hotels and motels, representing almost a quarter of a million rooms.

Darus Dat-Com, Consulting Firm, Appoints Paul B. Alper President

WAYNE, N.J. – Darus Dat-Com Ltd. has announced the appointment of Paul B. Alper as company president.

Darus offers data communications consulting, specializing in systems engineering and real-time programming. It is experienced in message switching and time-shared systems, data collection, transmission, distribution systems, communications front-ends, and most types of terminals and display equipment.

Darus accepts complete project management responsibilities from the proposal through equipment installations and system acceptance testing (including turn-key contracts), or any portion of the associated activities.

In addition, Darus also conducts studies of the data communications facilities and any related areas.

Alper had most recently been director for commercial systems project management at Western Union concerned with the design and implementation of both shared and dedicated data transmission systems. Prior to that, he had been associated with ITT and IBM.

Executive Corner

(Continued from Page 55)

ministration.

Other Moves

- George L. Bird Jr. has been appointed manufacturing vice-president for Kybe Corp., Waltham, Mass. He will be responsible for all manufacturing activities and will be involved in new product planning and engineering programs.
- Diablo Systems, Inc. of Hayward, Calif., has elected Robert C. Marshall vice-president of manufacturing.
- Allen M. Flagg has joined Certified Systems, Inc. as vice-president and sales manager. He will be responsible for managing and training salesmen for the General Microfilm Division.
- Michael F. Nolan has been appointed vice-president and director of marketing for Applied Cybernetics Corp., Sunnyvale, Calif.
- Access Corp., Cincinnati, Ohio, has appointed Edward J. Parish executive vice-president and chief operating officer, and Dean Willmann to the post of vice-president and manager of marketing operations.
- Frank E. Cole has been appointed president of the Electronic Instrumentation Division, Lear Siegler, Inc., Anaheim, Calif.
- Bedford Associates, Inc. of Bedford, Mass., has appointed Jan W. Grondstra vice-president, with particular responsibility in the design of computer interfaces, components, and systems.
- John K. Rondou has been promoted to vice-president, electronics group of Wyle Laboratories, El Segundo, Calif. Among his responsibilities is the Computer Products Division, which builds computer remote terminals and digital electronic circuit modules.
- Leasco Response, Bethesda, Md., has appointed Robert De Stefano executive vice-president and Robert R. Donaldson vice-president for marketing.
- Daedalus Computer Products, Inc., N. Syracuse, N.Y., has named Robert B. Ring to the position of vice-president and marketing manager.
- Rodolfo Aguilar has been elected senior vice-president of Slent Computer Corp. of Houston. The company also announced the appointment of Harley F. Eaker as a director of the company.
- Larry E. Reeder has been named vice-president of marketing of Computer Corp. of America, Cambridge, Mass.

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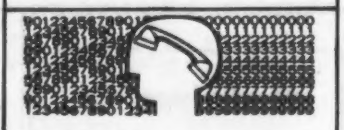

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Without special programming or programming effort
Without multiple cataloging in the core image library
With only one set of JCL statements per program
With easy scheduling of self-relocating programs
Without recataloging when you SYSGEN
With higher level languages like RPG and COBOL, as well as BAL.

DOSRELO is a proprietary program of Boothe Resources International, Inc., developed in conjunction with Bergin-Brunswig Drug Co.

Contact: Larry Lynch

BRI BOOTHE RESOURCES INTERNATIONAL, INC.
3435 WILSHIRE BOULEVARD
Los Angeles 90005 (213) 380-5700

Earnings Reports

CORNING GLASS WORKS

Year Ended Dec. 28

	1969	1968
aShr Ernd	$7.26	$6.79
Revenue	552,622,911	496,821,481
Earnings	50,029,547	46,766,679

a-After preferred dividend requirements.

SYSTEMS ENGINEERING LABS

25 Weeks Ended Dec. 12

	1969	1968
Shr Ernd	$.33	$.27
Revenue	9,144,000	7,048,000
Earnings	733,000	558,000

GERBER SCIENTIFIC INSTR.

Nine Months Ended Jan. 31

	1970	1969
aShr Ernd	$.54	$.24
Revenue	7,145,637	5,228,039
Earnings	539,954	242,927

a-Based on common and common share equivalents.

SCIENTIFIC RESOURCES

Three Months Ended Dec. 31

	1969	a1968
bShr Ernd	.....	.....
cRevenue	$13,568,367	$9,951,593
Earnings	55,014	90,424

a-Restated to treat Atlas Financial Corp. as a discontinued operation, as subsidiary is being sold; b-Common share earnings not calculated as preferred dividend requirements exceeded net income; c-From continuing operations.

WALLACE BUSINESS FORMS

Three Months Ended Jan. 31

	1970	1969
Shr Ernd	$.51	$.46
Revenue	8,099,000	7,347,000
Earnings	455,000	406,000
6 Mo Shr	1.01	.91
Revenue	15,531,000	14,055,000
Earnings	895,000	807,000

SCIENTIFIC COMPUTERS INC.

Six Months Ended Dec. 31

	1969	1968
aShr Ernd	$.06	$.07
Revenue	1,665,980	1,499,157
Spec Cred	.....	b50,000
Earnings	46,019	c105,783

a-Based on income before special credit; b-Provision for income taxes no longer required; c-Equal to 13 cents a share.

DIGITRONICS CORP.

Nine Months Ended Dec. 31

	a1969	1968
bShr Ernd	$.08	$.15
Revenue	13,201,118	11,980,368
Tax Credit	220,000	285,000
cEarnings	440,573	748,267

a-Includes acquisition made on a pooling of interests basis; b-Based on income before tax credits; c-Equal to 15 cents a share in 1969 and 25 cents a share in 1968.

APPLIED DATA RESEARCH

Year Ended Dec. 31

	a1969	a1968
bShr Ernd	$.16	$.39
Spec Chg	c45,570	.....
Earnings	d104,139	352,849

a-Reflects the Aug. 1969 acquisition of Programmatics Inc.; b-Based on income before special charge; c-Attributable to a plane crash and resulting fire in Nov. 1969 at its plant; d-Equal to 11 cents a share.

LEVIN-TOWNSEND COMPUTER CORP.

Nine Months Ended Dec. 31

	1969	a1968
Rev	$48,894,000	$52,297,000
Spec Chg	b13,414,000	.....
Loss	15,872,000	c8,683,000

a-Restated by company to include National Equities Inc. as a consolidated subsidiary from the date of acquisition, Aug. 1, 1968; b-Consists of $9,556,000 write-down to estimated net realized value of hotel and casino properties held for sale net of minority interests and applicable income tax, and $3,858,000 write-off of goodwill deemed to have no continuing value net of minority interests; c-Income.

DATA DESIGN LABORATORIES

Six Months Ended Dec. 31

	1969	a1968
Shr Ernd	$.12	$.11
Revenue	3,300,605	2,404,376
Earnings	124,900	112,480

a-Restated to reflect an acqusition on a pooling-of-interests basis.

COMPUTING & SOFTWARE INC.

Three Months Ended Jan. 31

	1970	a1969
bShr Ernd	$.31	$.23
Revenue	14,440,000	c13,986,000
Earnings	1,218,000	896,000

a-Restated to include companies acquired subsequently on a pooling-of-interests basis; b-Based on average common shares and common equivalent shares outstanding; c-Includes sales of $526,000 from discontinued operations.

WABASH MAGNETICS INC.

Year Ended Dec. 31

	1969	1968
aShr Ernd	$.72	$.28
Revenue	25,814,844	16,650,232
Earnings	1,276,490	498,594

a-Based on full dilution, reflecting conversion of preferred stock, Series A, and exercise of stock options, as computed by company.

CONTROL DATA CORP.

Year Ended Dec. 31

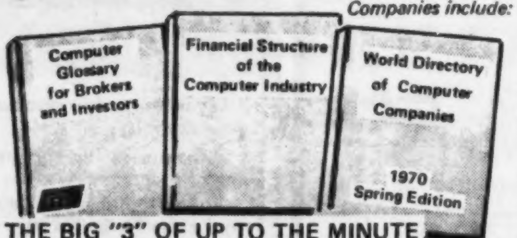
	a1969	1968
bShr Ernd	$3.19	$2.97
Revenue	570,766,145	468,833,451
Spec Cred	c6,140,371	303,478
dEarnings	53,336,487	44,092,730

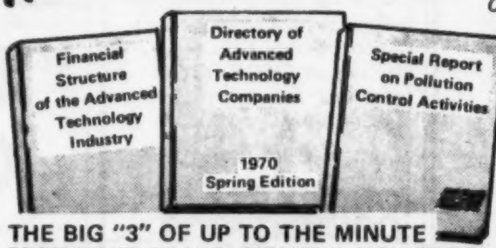
a-Final report; b-Based on income before special credit and on common and common share equivalents; c-Includes $3,498,767 applicable to Commercial Credit Co.; d-Equal to $3.62 a share in 1969 and $2.99 a share in 1968.

New Registrations

BRADFORD COMPUTER & SYSTEMS, INC., 1700 Broadway, New York 10019, a company engaged in the information systems business, filed to register 190,000 shares of common stock. Proceeds, at $75 per share maximum, intended for expansion of present computer and clerical services as well as development of new related services (including building and equipping a new computer-clerical processing facility); for further investments in Dramer Research, Inc., Instrumentation Engineering, Inc., and certain other companies; for establishment of a training center for personnel; for increased working capital and for expansion of offices, systems development, and facilities management services. The underwriter is Kidder, Peabody and Co., Inc., 20 Exchange Pl., New York

PATH COMPUTER EQUIPMENT, INC., 20 Beckley Ave., Stamford, Conn. 06901, a company engaged in the design, development, manufacturing, and marketing of computer peripheral and communications related devices, filed to register 400,000 shares of common stock. Proceeds, at $7.50 per share maximum, intended for the repayment of interim financing, for the purchase of certain assembly and test equipment; for furniture and fixtures; for the purchase of electronic subassemblies, machine parts, and raw materials for product development; for the purchase of tooling and other capital items; for expansion of the company's marketing staffs and promotion; and for working capital. The underwriter is Philips, Appel & Walden Inc., 111 Broadway, New York.





Blackouts Blamed on Switchover

TORONTO, Canada – Frequent computer blackouts in the Toronto Stock Exchange are being blamed on a switchover to a new dial quotation service now in progress.

Over the past two weeks the service has been out of commission from 5% to 60% of trading time each day, according to an exchange spokesman.

The dial quotation service is a wire service which allows stockbrokers to obtain current printed information on the trading of any listed stock.

The new system, Canadian Data Service (Candat), will allow subscribers to obtain up-to-the-minute trading information and statistical tables on any stock by punching code letters on a keyboard.

The present dial quatation service provides the same information when the code numbers are dialed on a telephone-type dial. The new system will provide more information on New York stocks than is presently available, the spokesman said.

Meanwhile, stock exchange officials are hoping that the bugs in their central computer will be ironed out by the team of four computer experts who are studying the system day and night to find out why nightly testing of the new system fouls up the existing service during trading hours.

"We hope that by applying this type of intensive effort the problem will be resolved soon," the spokesman said.

RCA Computer Sales Jump 40% Despite Fourth Quarter Tailoff

NEW YORK – Domestic computer sales of RCA Corp. for 1969 were approximately 40% higher than in 1968 and represented close to a threefold growth in the past five years. The backlog of computer orders was also 30% greater than a year ago, according to Robert W. Sarnoff, company chairman and president.

Company sales rose to an all-time high in 1969 while earnings were at the second-best level in RCA Corp.'s 50-year history, he said. In releasing the 1969 annual report, Sarnoff noted that the contradictory course of the national economy was reflected in the performance of RCA, with softness in color television, commercial electronics, and defense business offset by strength in broadcasting, services, and computer operations.

Final sales figures for 1969 were $3,221,679,000, an increase of 2% over the previous record of $3,158,781,000 in 1968. Profit after taxes was $151,283,000, compared with a record $154,743,000 a year earlier.

Earnings per share of common stock for 1969 came to $2.32 as against the all-time high of $2.37 per share in 1968.

Fourth quarter sales in 1969 were $870,813,000, as compared with $849,141,000 in 1968's final quarter. Profit for the three-month period was $44,520,000, as against $52,158,000 for the previous year.

"During the fourth quarter," Sarnoff explained, "consumer confidence waned and potential buyers deferred their purchase of durable goods, while commercial markets continued to soften under the influence of a tight money policy. Along with many others in industry, RCA was forced to scale down its expectations for the year as well as for at least the first half of 1970."

Reviewing the company's performance in 1969, Sarnoff said the business trend in the final months was disappointing. Nevertheless, he described the decade of the sixties as the era of the greatest progress in RCA's history.

"From 1960 to 1969," Sarnoff noted, "our sales virtually doubled, while net profit and net earnings per share more than tripled. The decade included seven consecutive years of record RCA sales and earnings, with profit momentum flagging only as the current unfavorable economic climate developed.

"Looking beyond the current temporary setback to the national economy, we believe that the next 10 years promise to bring revolutionary changes to all the markets and technologies with which RCA is concerned, domestically and around the world. As a result of the basic steps taken to modernize the company's structure and outlook, we believe that RCA is now in a strong position to move forward as a world leader in electronics during the decade ahead."

Sarnoff said RCA was benefitting significantly by having developed a broad base in many businesses and many markets. This, he added, was helping RCA today to weather a period of general economic adversity. Tomorrow, he said, "it can provide us with an unusual breadth and perspective in evaluating and exploiting new opportunities for growth and profit and a wealth of skills applicable to many new fields of technology and business."

The RCA chief executive noted that, as the year ended, the board of directors accepted with deepest regret the resignation of Chairman David Sarnoff, thus ending a 63-year career that "encompassed and helped to shape the history of the electronics industry." He described Gen. Sarnoff as the "principal architect and moving force" of RCA's first half century.

L-T Eyes $8 Million Sale of Las Vegas Holdings to Canadian Investing Group

NEW YORK – Negotiations are continuing into the sale of the controversial Bonanza Hotel in Las Vegas by the Levin-Townsend Computer Corp.

Company officers revealed that they had received an $8 million offer for the hotel and the adjoining land from Ross MacLean and Associates of Vancouver, B.C.

The negotiations to sell the hotel were disclosed recently in a civil suit filed in federal district court against Levin-Townsend and four of its directors by Howard Levin, who was removed from the presidency of the company in January.

Levin's suit announced that he will attempt to regain control of the company by proxy at the annual meeting in July.

Diversification Program

The company's principal interests are in computer leasing and real estate. Levin's diversification program which involved the acquisition of the unprofitable Bonanza Hotel and additional gambling interests has been the principal bone of contention within the company.

After Levin was replaced as president by his former partner, James E. Townsend, the company reported a net loss of $15.9 million for the last nine months of 1969 after major write-downs and write-offs of the Bonanza and other investments.

Levin's suit accuses the directors of issuing false and misleading financial information and particularly of excessive write-downs against the Bonanza.

The suit also seeks an injunction to prevent the directors from spreading false or misleading information and from soliciting proxies for the annual meeting, or from holding the meeting until the suit is decided.

A spokesman for the company said that Levin-Townsend denied all the allegations in the suit and said that they were without merit.

The company acquired the Bonanza Hotel in 1969 for about $10.5 million, but incurred additional costs in reopening the casino, thus raising the cost to about $13.4 million.

Levin-Townsend's current management subsequently lowered the book value of the operation to about $3.9 million on the company's balance sheet.

The company spokesman said that much interest in the property had been shown, but the company was dealing solely with the Canadian company.

He indicated that the $8 million offer was acceptable as long as other conditions could be worked out.

"We are continuing negotiations toward a sale, but there is no assurance that we will be successful," he said.

In Canada, a spokesman for the Ross MacLean group said that the group plans to operate the Bonanza if the sale is completed. He said the group is more interested in the remainder of the property.

This involves an adjacent 26 acres which were acquired for about $1.5 million by National Equities, Inc., a subsidiary of Levin-Townsend.

PPI Vetoes C&S Acquisition Plan

LOS ANGELES – Pacific Plantronics Inc. (PPI) has ended its agreement in principle to be acquired by Computing and Software Inc.

PPI, Santa Cruz, Calif., manufactures voice and data communication equipment. Computing & Software Inc., Los Angeles, operates computing centers and develops computer software.

No reason was given for the break-off. As announced last month, [CW, Febrary 18] Computing &Software would have exchanged one common share for each 1.9 shares of PPI. This would have involved about 380,000 C&S shares, having a market value of $27 million. Based on C&S's closing price that day on the American Stock Exchange of $57,625, the transaction now would have been valued at about $21.9 million.

Under that agreement, if, on the day PPI shareholders met to approve the transaction, the value of C&S shares exceeded $31 million, the number of shares would be reduced to a value equal to $31 million.

PPI, in the six months ended Nov. 30, earned $483,024, on sales of $5 million.

Viatron Down $9.4 Million, $3.39/Share

BEDFORD, Mass. – Viatron Computer Systems Corporation here reported a consolidated net loss of $9,471,615 or $3.39 per share for the fiscal year ended Oct. 31, 1969. The loss reflected company expenses incurred in the start up of manufacturing operations, the design and production of custom MOS arrays, and other product development costs, according to Viatron.

The company has acquired an additional 158,000 sq ft of space for manufacturing and support operations here, which will just about double its production area.

Viatron said its major accomplishments, during this fiscal year, included the first deliveries of System 21 machines, the establishment of Viatron's first system manufacturing factory, the establishment of Viatron's first microelectronics production facility, the announcement of two small general purpose computers, and the initial establishment of an international marketing operation overseas.

Mathew F. Thompson, Viatron's vice-president for manufacturing operations, said that the new site should provide the space required to accommodate the immediate manufacturing needs of the corporation through 1970.

Dr. James J. Cannon Jr., treasurer of Viatron, indicated that the corporate headquarters and marketing staff would also be transferred to the new complex to make room for the corporation's expanding microlectronics manufacturing complex.

The present corporate headquarters' building will be dedicated exclusively to Viatron's microelectronics operations led by Laurence Drew, vice-president. Drew said he anticipated that additional space will soon be added to this building to accommodate expansion of the microelectronic operations.

CDC Cuts 750 Twin Cities Workers

MINNEAPOLIS, Minn. – A layoff of at least 750 of 15,000 Control Data Corp. employees has occurred in the Twin Cities, informed sources stated.

A company spokesman declined comment on the extent of the companywide cost-cutting program. Memos sent to management contained instructions to reduce personnel and expenses by at least 5% by March 1. A similar reduction was expected to occur during March, the sources reported.

Control Data spokesmen cited the tightening economy and a significant drop in computer sales as reasons for the cutback.

N.Y. Court Okays Transfer

NEW YORK – Justice Samuel M. Gold of the New York State Supreme Court has ruled for Bernard N. Riskin in his suit against his former employer, National Computer Analysts Inc., to compel the company to transfer 34,960 shares of unregistered stock in the concern.

Under the ruling, a company cannot delay the transfer of unregistered shares once the SEC indicates it will not block or undo the action.

McDonnell & Co. Claims DP Problems Helped Failure

NEW YORK – The computer appeared as a scapegoat again last week when an automated back office system at McDonnell & Co. was blamed in part for the failure of the 65-year-old securities dealer.

The firm, which had revenues of $33 million in 1968, announced last week that it would gradually liquidate its business. The New York Stock Exchange, of which McDonnell is a member, will aid the firm during the liquidation period.

The failure highlights the operational problems that many of the big board firms are having with their back office "paper-jam" and with attempts to computerize many of the stock-trading functions handled by the large brokerage houses.

With the heavy trading volume in the securities industry in 1968 and 1969, many of the big board member firms turned to computer systems to aid in keeping up with the mounting paperwork. In the case of McDonnell, the system seems only to have aggravated the problems.

The McDonnell statement of liquidation lists among the problems leading to the failure "the failure of a new computer system to operate as it had been planned, compounding the back office problems during the latter part of 1968 when stock brokerage volume was at a record level."

A McDonnell spokesman said that the problem with the automated back office system was "a total system problem," and that the firm was not blaming a computer for its failure. The failure of the system to operate properly, he said, involved the whole back office operation at McDonnell, from clerks through the machine software.

The McDonnell system had been designed by Data Architects Inc. and ran on an IBM 360/40, the spokesman said.

Two Hippies Set-Up UK Venture Firms

Special to Computerworld

LONDON – Two happy hippy entrepreneurs in the UK are Charles Ross and Michael Gassmann who between them own 30% of Miles Roman Ltd., one of the largest venture capital enterprises in the technology area so far launched in Europe.

Ross and Gassmann are among a small and exclusive group of UK computer entrepreneurs who have actually made it in hard cash rather than reputation. They established the first stock exchange valuation real-time service in the UK some four years ago on very limited capital at a time when conservative finance sources did not wish to know them. At one time it was their boast that they had been thrown out of the best banks in England.

Their company, Intinco, and their service, Scan, prospered and they sold out to the giant International Publishing Co., owners of the Daily Mirror, at a time when their activities had extended into computer typesetting, Computaprint Ltd., and a standard bureau operation.

For their new company the two have raised about $7.68 million from merchant bankers.

The first two companies to be launched are Autonomics Ltd., a service company in the real-time area and Software Sciences, a software operation. The enterprise is also to be backed by the National Research and Development Corporation who have agreed to provide up to $1.2 million in development funds.

The NRDC is a government-supported body set up to provide funds for development work on projects likely to show a profit in return for a share of the equity or profits of any subsequent operation. In this case 5% of the equity has been reserved for them. Projects backed by the NRDC in the past have included minicomputers and hovercraft, and they have a better than even winning record on projects chosen for investment.

Second User Equipment Market Seen Very Srong

NEW YORK – Though the prevailing tight money market is restricting the growth of many sectors of the national economy, the second-user equipment market remains strong, as more firms search for bargains by turning to used office machines and data processing equipment to meet their business needs.

Stuart Rubenstein, chairman of the board of I.O.A. Data Corp., said that second-user computers and business machines sales "should benefit by this trend."

Elaborating on the economics involved, Rubenstein said that many third generation data processing systems three to four years old command 70 to 80% of their original price in the second-user market and frequently more. "A three-year-old IBM high speed printer compatible with third generation systems can be sold for 90 to 100% of its original sale price," he said.

One of the reasons for the relatively high value of certain used computers and related equipment, Rubenstein said, is that in the case of IBM, for example, the manufacturer's original equipment service guarantees follow the equipment, no matter who buys the system. Thus, the second and third user receive the benefits of service guarantees previously held by the original purchaser.

"Realistically," he stated, "computers do not wear out; their performance capability remains as high as when purchased and if that capability meets a prospective purchaser's business needs, a used data processing system can be an excellent buy." Once a new system is debugged and operating smoothly, he added, subsequent purchasers get the same high speed performance enjoyed by the original buyer.

An additional and extremely important factor that augurs well for the second-user equipment market in general is the near term probability of an end to the generally prevailing scarcity of used data processing equipment. This will mean more available hardware to satisfy the heavy demand by prospective buyers. This development stems from a large number of leases that are now terminating for second and third generation systems. "As a result," Rubenstein said, "many of these computers will come onto the market and can be expected to give further stimulus to our business."

XDS and Data Architects To Help Back Office DP

WALTHAM, Mass. – Xerox Data Systems Inc., a Xerox Corp. subsidiary based in El Segundo, Calif., and Data Architects, Inc., Waltham, have agreed to offer jointly a computer programming system to automate the back offices of securities firms.

The system, developed by Data Architects and known as DaiSecure, is expected to require an initial investment of $9.5 million.

Scheduled to be available in New York about October, and elsewhere in 1971, the system will "significantly reduce the costs of a transaction" and help to avoid errors, according to the companies.

Dai-Secure integrates all the activities, files, and functions required for a total brokerage system, the companies said.

Charges to brokerage firms under the Dai-Secure program will be on a per-trade basis.

Earlier this year, IBM claimed to have developed a program which allowed brokerage houses to replace manual processing of certificates with a computerized information and recording system. IBM's program will be available in December at a cost of $300/mo.

CW Financial
ON THE LIGHTER SIDE

"One of the Best Features of This New Design Is It Will Make Us a Lovely Profit . . ."

"I Must Caution You, However, That Certain Ominous Freudian Overtones Hover About This Seemingly Good Growth Forecast I Have Made."

Nickels and Dimes

DATA INSTRUMENTS CO., maker of Dataplex terminals and processors for off-line computers, had its first public issue oversubscribed, according to President Gerald B. Spleen. With Mitchem, Jones, and Templeton heading the underwriting, $2.5 million at $10 a common share was raised.

$ $ $

SYCOR INC. and **ELECTRONIC MEMORIES & MAGNETICS CORP.** (EMM), have agreed for EMM to provide Sycor up to $1.85 million in six-month, 6% convertible secured notes. Sycor will use these notes for working capital. The two companies are conducting studies to determine whether it would be advantageous to negotiate further arrangements concerning long-term financing by EMM of Sycor, according to Samuel N. Irwin, Sycor president.

$ $ $

EDUCATIONAL SCIENCES PROGRAMS INC. and **COMPUTER STUDIES INC.**, have agreed in principle to merge through an exchange of stock.

Under terms of the transaction, subject to the approval of stockholders and directors of both companies, Computer Studies would exchange its 525,000 shares on the basis of 1.6 shares for each share of Educational Sciences stock. Educational Sciences would be the surviving company.

Educational Sciences owns and operates a civil service and vocational training center and several home-study and remedial education services. Its stock, traded over the counter, was recently quoted at $21 a share.

Computer Studies, which is also in the service and education field, has operations in several Midwestern and Eastern cities. Its stock, also traded over the counter, was recently quoted at $10 a share.

$ $ $

PROGRAMMING SCIENCES' board has approved a 100% stock dividend pending shareholder approval of an increase of authorized common from two million to 10 million shares. The purpose of the increase is to permit future acquisitions. The company netted $201,000 on sales of $1.9 million for the first nine months of the year.

$ $ $

WESTERN UNION INTERNATIONAL, INC. New York, has continued its unbroken record of improvement in each of the six years of the company's independent operations.

Operating revenues in 1969 rose to $36,673,000 from $30,745,000 in the prior year while net income increased to $4,115,000 from $3,502,000. On a per share basis, net income moved to $1.52 from $1.30 in the prior period.

The international communications company also reported that since 1964, the first full year of independent operations, operating revenues have increased almost two and one-half times and net income during this same period was increased over six times.

Computerworld Stock Trading Summary

NEW YORK AND AMERICAN STOCK EXCHANGE CLOSING PRICES, FRIDAY, MARCH 20; OVER THE COUNTER, THURSDAY, MARCH 19

SUPPLIES & ACCESSORIES

EXCH	'69-'70 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK % CHANGE
O	47- 31	44 1/2	ACME VISIBLE	+ 8 1/4	+ 22.76
N	22- 11	12 1/8	ADAMS-MILLIS CORP	- 1/2	- 3.96
O	27- 15	16 1/2	BALTIMORE BUS FORM	- 1/2	- 2.94
A	29- 13	13	BARRY WRIGHT	- 1	- 7.14
O	44- 26	29 1/8	DATA DOCUMENTS	- 5/8	- 2.10
N	19- 15	15 3/8	ENNIS BUS. FORMS	- 1 1/8	- 6.82
N	173- 65	119 5/8	MEMOREX	- 2 7/8	- 2.35
N	118- 94	102	3M COMPANY	- 3	- 2.86
O	39- 24	36 7/8	MOORE BUS FORMS	- 5/8	- 1.67
N	49- 36	36 1/8	NASHUA CORP.	- 2 3/8	- 6.17
O	48- 30	44 3/4	REYNOLDS & REYNOLD	- 2 3/4	- 5.79
O	31- 23	29 1/4	STANDARD REGISTER	+ 3/4	+ 2.63
N	39- 8	37 1/8	UARCO	+ 7/8	+ 2.41
A	30- 10	16 1/2	WABASH MAGNETICS	- 7/8	- 5.04
O	41- 28	39 1/4	WALLACE BUS FORMS	- 3/4	- 1.87

COMPUTER SYSTEMS

EXCH	'69-'70 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK % CHANGE
N	172-120	135 1/2	BURROUGHS CORP	+ 4 1/4	+ 3.24
N	69- 20	24 7/8	COLLINS RADIO	+ 1/8	+ 0.51
N	159- 58	62 3/4	CONTROL DATA CORP	- 2 3/4	- 4.20
A	124- 54	97 3/4	DIGITAL EQUIPMENT	- 8 1/4	- 7.78
N	25- 7	8 1/8	ELECTRONIC ASSOC.	---	----
A	28- 9	9 1/2	ELECTRONIC ENGINEER.	- 1/2	- 5.00
N	45- 25	36 3/4	FOXBORO	- 1/4	- 0.68
N	98- 67	69 7/8	GENERAL ELECTRIC	- 3/8	- 0.53
N	57- 45	45 1/4	HEWLETT-PACKARD CO	- 1 7/8	- 3.97
N	207- 57	122 5/8	HONEYWELL INC	- 2	- 1.60
N	387-291	319 3/4	IBM	- 4 1/2	- 1.39
N	171-108	131 1/8	NCR	+ 1/4	+ 0.19
N	48- 29	30 1/2	RCA	- 1/4	- 0.81
N	50- 26	26 3/4	RAYTHEON CO	- 1/4	- 0.93
O	43- 1	4	SCI. CONTROL CORP.	- 1 1/4	- 23.81
N	55- 33	36 1/8	SPERRY RAND	- 1 5/8	- 4.30
A	53- 26	34 5/8	SYSTEMS ENG. LABS	- 2 1/8	- 5.78
N	37- 22	24 3/8	VARIAN ASSOCIATES	- 1 1/8	- 4.41
A	61- 36	38 1/8	WANG LABS.	- 1 1/4	- 3.17
N	115- 85	90 3/8	XEROX CORP	+ 1/8	+ 0.14

PERIPHERALS & SUBSYSTEMS

EXCH	'69-'70 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK % CHANGE
N	85- 24	44 3/8	ADDRESSOGRAPH-MULT	- 1	- 2.20
O	71- 9	9 7/8	ALPHANUMERIC	- 1/2	- 4.82
N	49- 32	35 1/8	AMPEX CORP	- 5/8	- 1.75
A	36- 8	9	ASTRODATA	- 7/8	- 8.86
O	19- 8	9 3/4	BOLT,BERANEK & NEW	- 1/2	- 4.88
N	17- 9	12 3/4	BUNKER-RAMO	---	----
A	37- 18	25 3/4	CALCOMP	- 1	- 3.74
O	38- 8	9	COGNITRONICS	- 1 1/4	- 12.20
O	28- 8	10 1/4	COLORADO INST.	+ 2	+ 24.24
O	48- 27	29	COMPUTER COMMUN.	- 1	- 3.33
A	16- 7	7 3/8	COMPUTER EQUIPMENT	- 3/4	- 9.23
A	27- 12	18 1/4	DATA PRODUCTS CORP	+ 3/4	+ 4.29
O	43- 15	18 1/2	DATA TECHNOLOGY	- 1 1/2	- 7.50
O	22- 8	8	DIGITRONICS	- 1/4	- 3.03
N	43- 23	23 7/8	ELECTRONIC M & M	- 2 1/4	- 8.61
O	18- 5	5 3/4	FABRI-TEK	- 3/4	- 11.54
O	37- 9	9 1/2	FARRINGTON MFG	- 1 1/2	- 13.64
O	21- 10	14	INFORMATION DIS	- 1 1/2	- 9.68
A	82- 13	34 3/4	MARSHALL INDUSTRIES	- 3 1/4	- 8.55
A	84- 17	59	MILGO ELECTRONICS	- 2 1/4	- 3.67
A	89- 55	56 1/4	MOHAWK DATA SCI.	- 4 1/2	- 7.41
O	118- 29	29	OPTICAL SCANNING	- 4	- 12.12
O	31- 10	10	PHOTON	- 1 3/8	- 12.09
O	15- 3	3	PHOTO-MAGNETIC SYS.	- 1	- 25.00
A	46- 23	35 1/4	POTTER INSTRUMENT	- 3 1/8	- 8.14
O	42- 15	19	PRECISION INST.	- 1	- 5.00
O	82- 45	50 1/2	RECOGNITION EQUIP	- 3	- 5.61
O	36- 25	28	REDCOR CORP.	- 2 1/2	- 8.20
N	61- 16	16	SANDERS ASSOCIATES	- 1 1/2	- 8.57
O	85- 25	26	SCAN DATA	---	----
O	36- 15	19 1/4	TALLY CORP.	- 1 1/4	- 6.10
N	159- 20	116 3/4	TELEX	+ 3 5/8	+ 3.20
O	58- 14	30 1/4	VIATRON	+ 3	+ 11.01

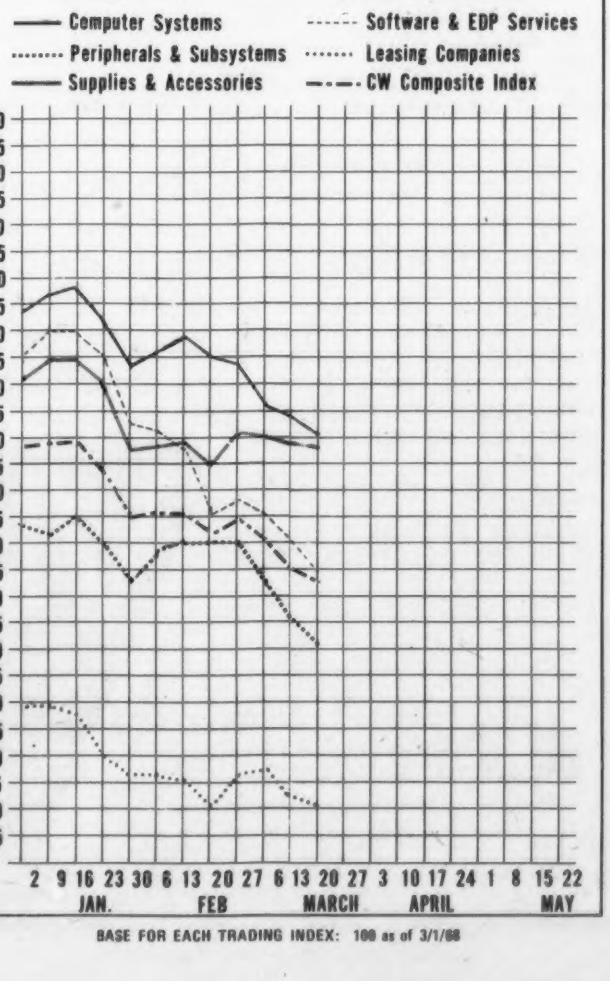
LEASING COMPANIES

EXCH	'69-'70 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK % CHANGE
O	14- 6	9	BANISTER CONTIN	- 3/8	- 4.00
O	45- 20	22	BOOTHE COMPUTER	- 1/2	- 2.22
O	18- 4	6 1/2	COMPUTER EXCHANGE	+ 1/4	+ 4.00
O	34- 8	9	COMPUTER LEASING	---	----
O	15- 7	10	CYBER-TRONICS	- 1 1/4	- 11.11
A	60- 19	20 1/8	DATA PROC. F & G	- 7/8	- 4.17
O	16- 2	5	DATRONIC RENTAL	- 1/2	- 9.09
A	52- 18	19 1/8	DEARBORN COMPUTER	- 1 7/8	- 8.93
A	16- 6	6 5/8	DPA, INC.	---	----
A	45- 14	15 7/8	GRANITE MGT	+ 1/8	+ 0.79
A	28- 11	11 1/8	GREYHOUND COMPUTER	- 1 1/4	- 10.10
N	54- 16	18 1/8	LEASCO DATA PROC.	- 1	- 5.23
O	9- 4	5 3/8	LECTRO COMP LEAS	- 1/4	- 4.44
A	57- 8	9 1/4	LEVIN-TOWNSEND CMP	---	----
O	8- 1	2 1/2	LMC DATA, INC.	- 1/4	- 9.09
O	14- 2	2 3/8	MANAGEMENT ASSIST	- 1/2	- 17.39
O	12- 6	8	NCC LEASING	---	----
O	34- 3	5 3/4	SYSTEM CAPITAL	---	----
A	28- 13	17 3/4	U.S. LEASING	+ 1/4	+ 1.43

SOFTWARE & EDP SERVICES

EXCH	'69-'70 RANGE	CLOSING PRICE		WEEK NET CHANGE	WEEK % CHANGE
O	14- 4	5 1/2	ADVANCED COMP TECH	- 1/4	- 4.35
A	32- 7	8	APPLIED DATA RES.	- 3/4	- 8.57
O	19- 3	3	ARIES	- 3/4	- 20.00
A	47- 34	37 1/2	AUTOMATIC DATA PRC	- 2 1/8	- 5.36
O	16- 7	8 1/4	AUTO SCIENCES	- 1 3/4	- 17.50
O	17- 4	5	BRANDON APPL SYS	---	----
O	7- 1	2 3/8	COMPUTER AGE INDUS.	- 1/8	- 5.00
A	21- 6	7 3/4	COMPUTER APPL	- 1/8	- 1.59
O	16- 6	10	COMPUTER ENVIRON	- 1	- 9.09
O	47- 9	9	COMPUTER NETWORK	- 1 3/4	- 16.28
N	34- 19	20 5/8	COMPUTER SCIENCES	- 2 3/8	- 10.33
O	40- 5	6 1/2	COMPUTER USAGE	- 1/4	- 3.70
A	75- 37	54 1/8	COMPUTING & SOFT	+ 7/8	+ 1.64
O	9- 1	1 3/4	CONSOL. ANAL. CENT.	- 1/4	- 12.50
O	26- 13	16 1/2	DATA AUTOMATION	- 3/4	- 4.35
O	30- 17	20 3/4	DATA PACKAGING	- 1 3/4	- 7.78
O	24- 3	4 1/4	DATAMATION SERVICE	- 1/8	- 2.86
O	17- 5	7 1/2	DATATAB	+ 1/2	+ 7.14
O	15- 2	3 1/2	DIGITEK	- 7/8	- 20.00
O	26- 9	11 1/2	EDP RESOURCES	---	----
A	38- 7	8 1/8	ELECT COMP PROG	- 2 1/4	- 21.69
O	30- 12	14 1/2	INFORMATICS	- 1 1/4	- 7.94
A	37- 14	14 1/8	ITEL	- 1 5/8	- 10.32
O	21- 3	4	LEVIN-TOWNSEND SERV.	- 1/2	- 11.11
A	34- 13	19 1/2	MANAGEMENT DATA	- 2	- 9.30
O	22- 4	6 1/4	NAT COMP ANALYSTS	- 1 1/4	- 16.67
A	53- 23	39	PLANNING RESEARCH	+ 1 3/4	+ 4.70
O	27- 13	17	PROGRAMMING METHODS	- 4	- 19.05
O	11- 3	4	PROGRAMMING & SYS	- 1/4	- 5.88
O	37- 11	17	PROGRAMMING SCIENCES	- 6	- 26.09
N	35- 6	7 7/8	SCIENTIFIC RESOURCES	---	----
O	10- 1	1 7/8	SOFTWARE SYSTEMS	---	----
O	37- 2	2 1/2	STRATEGIC SYS	---	----
O	36- 11	16	TBS COMP CENT INC.	- 2	- 11.11
O	12- 3	4	UNITED DATA CENTER	- 3/4	- 15.79
N	155- 43	43 5/8	UNIVERSITY COMP.	- 5 1/4	- 10.74
O	38- 16	17 1/8	URS SYSTEMS	- 3 5/8	- 17.47
O	16- 6	10 1/4	U.S. TIME-SHARING	+ 1/4	+ 2.50

Computer Stocks Trading Index



BASE FOR EACH TRADING INDEX: 100 as of 3/1/68